MARC 2008

User's Manual

Manure
Application
Rate Calculator
Version 2.1.3

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Manitoba

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Table of Contents

1 INTRODUCTION TO MARC 2008 1

2 MARC 2008 INSTALLATION 2

2.1 Program Setup 2
2.2 Starting MARC 2008 5
2.3 Creating a Shortcut to MARC 2008 5
2.4 Entering Planner Information 5

3 PROGRAM CONVENTIONS 6

3.1 Program Structure 6
3.1.1 The Farm 6
3.1.2 Calibration 7
3.1.3 The Land Application Plan 7
3.1.4 Moving between the Farm and the Plan 8

4 PROGRAM CONVENTIONS 9

4.1 Navigating the Program 9
4.2 Help Screens 9
4.3 Changing Units 9
4.4 The Main Menu and Toolbar Functions 10
4.4.1 File 10
4.4.2 Additional Functions from the Toolbar 11
4.4.3 Reports 11
4.4.4 Exporting a Plan 12
4.4.5 Importing a Plan 13
4.4.6 Importing MARC 2005 Files 14

5 GETTING STARTED 17

5.1 Using MARC 2008 for the First Time 17
5.2 Opening an Existing Farm or Creating a New Farm in MARC 2008 17
5.3 Opening an Existing Plan or Creating a New Plan in MARC 2008 18
5.4 Opening a Farm or Plan from within MARC 2008 18
5.5 Saving Information 18
5.6 Creating Lists 19

6 MARC 2008 DATA ENTRY 20

6.1 The Farm 20
6.1.1 The Farm Info Screen (1/6) 20
6.1.2 The Livestock Screen (2/6) 21
6.1.3 The Fields Screen (3/6) 23
6.1.4 The Manure Storage Screen (4/6) 25
6.1.5 The Plan List Screen (5/6) 26
6.1.6 The Calibration Screen (6/6) 28
6.2 The Land Application Plan 30
6.2.1 The Manure Screen (1/8) 30
6.2.2 The Select Fields Screen (2/8) 35
6.2.3 The Crop Screen (3/8) 36
6.2.4 The Fertilizer Screen (4/8) 38
6.2.5 The History Screen (5/8) 40
6.2.6 The Manure Application Screen (6/8) 42
6.2.7 The Nutrient Summary Screen (7/8) 45
6.2.8 The Land Application Summary Screen (8/8) 46

7 MANURE MANAGEMENT PLAN REPORTS 49

APPENDIX A: LIQUID MANURE APPLICATION RATE CALCULATION WORKSHEET..... 51

APPENDIX A: SOLID MANURE APPLICATION RATE CALCULATION WORKSHEET..... 54

APPENDIX B: DRYLAND AGRICULTURE CAPABILITY GUIDELINES FOR MANITOBA ... 57

APPENDIX C: MANURE MANAGEMENT PLAN REPORTS..... 60

1 Introduction to MARC 2008

The Manure Application Rate Calculator (MARC) 2008 is manure management planning software for Manitoba. MARC 2008 is a more advanced version of MARC 2005, which was adapted from NMan97 software for Ontario. MARC 2008 has been created in Visual Basic 6.0 with data stored in Microsoft Access. It is designed to:

- provide improved record keeping for crop and livestock producers who use manure as a fertilizer;
- provide an easy-to-use program that allows nutrient management planners to create multiple plans for multiple operations;
- provide an extensive database of manure nutrient analyses;
- provide the flexibility to create full crop fertilization plans;
- allow the user to balance manure with commercial fertilizer;
- allow field-by-field management of nutrients based on nitrogen and phosphorus;
- allow split applications of manure;
- assist with the calibration of application equipment;
- automatically fill out manure management plan reports;
- save, print or email reports as easy-to-read PDF files; and
- assist producers in fulfilling regulatory requirements.

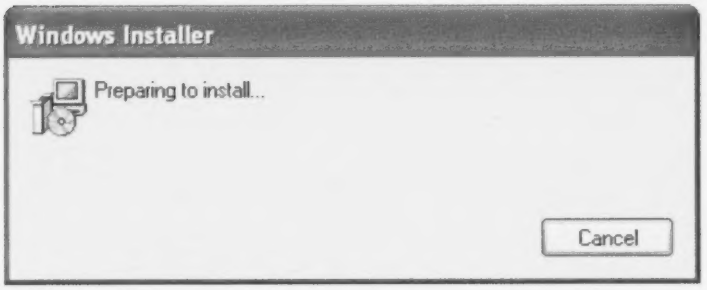
MARC 2008 uses the programming features of Visual Basic to make it user-friendly and the Microsoft Access database features to improve record keeping capabilities. MARC 2008 will automatically generate reports and provides the possibility of electronic submission of manure management plans to regulatory agencies.

Before using MARC 2008, it may be helpful to fill out the worksheet found in Appendix A. This worksheet will prepare you for information requirements of the program and will help you to understand the basics of calculating a manure application rate.

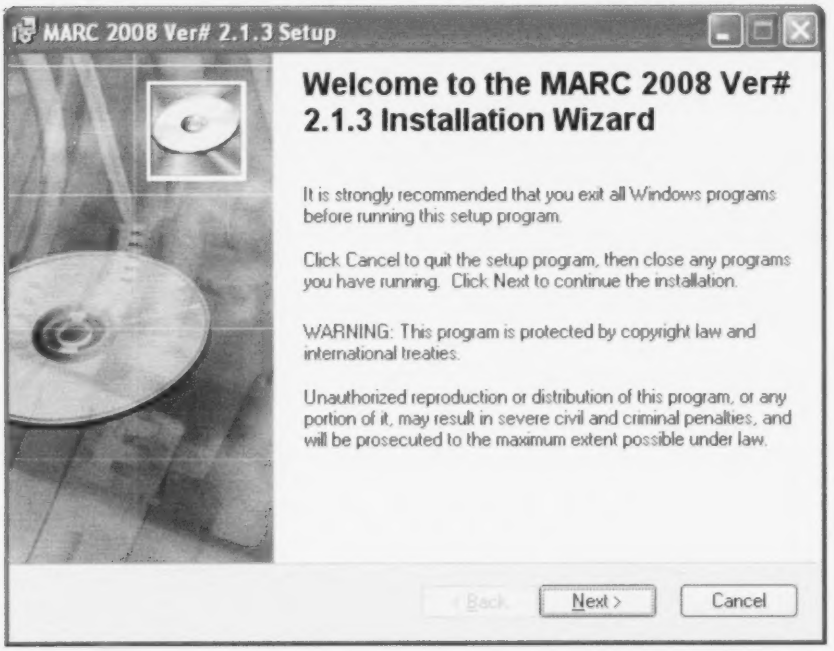
2 MARC 2008 Installation

2.1 Program Setup

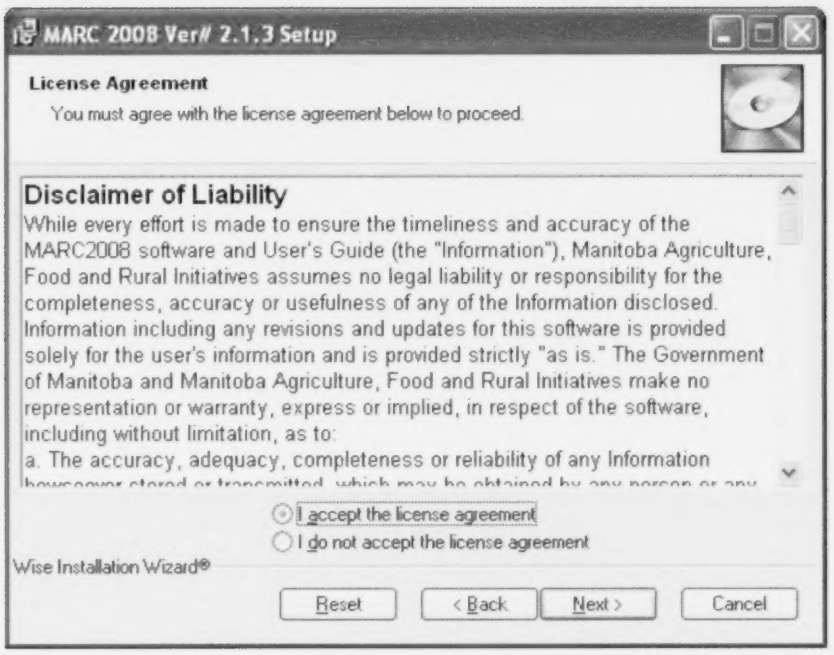
a. Start Windows. Make sure that no other application is running while MARC 2008 is being installed.
b. Insert the MARC 2008 CD into your CD drive.
c. Start Windows Explorer and locate your CD drive. Double click on the file on the CD named SETUP.EXE. This window will appear while the computer prepares to install MARC 2008:



d. Once the installation program is prepared, the Welcome screen will appear:


MARC 2008 Ver# 2.1.3 Setup
Welcome to the MARC 2008 Ver# 2.1.3 Installation Wizard
It is strongly recommended that you exit all Windows programs before running this setup program.
Click Cancel to quit the setup program, then close any programs you have running. Click Next to continue the installation.
WARNING: This program is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.
< Back
Next >
Cancel

e. Click on Next to initiate the Disclaimer of Liability and the License Agreement. You must **accept the license agreement** and click on Next to proceed.


MARC 2008 Ver# 2.1.3 Setup
License Agreement
You must agree with the license agreement below to proceed.
Disclaimer of Liability
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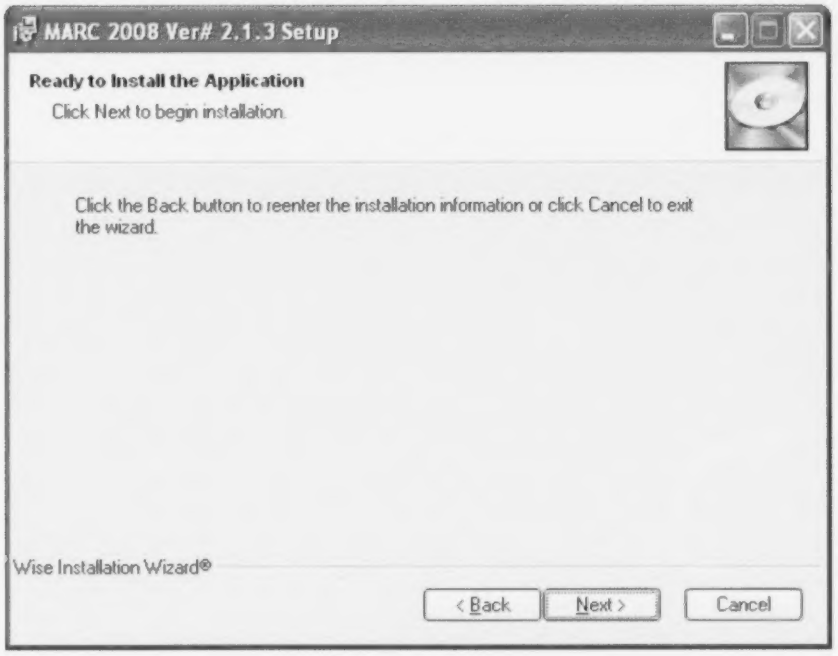
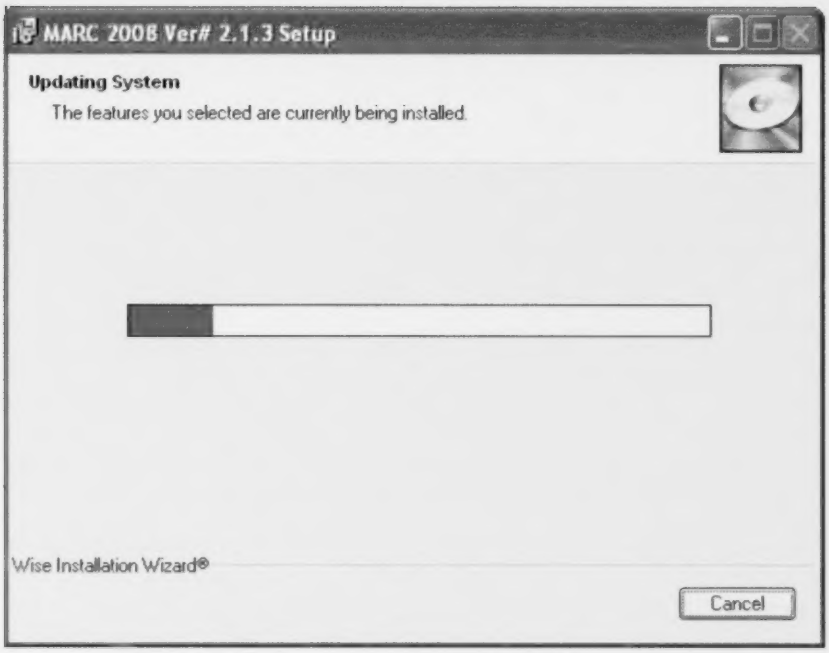
a. The accuracy, adequacy, completeness or reliability of any Information
I accept the license agreement
I do not accept the license agreement
Wise Installation Wizard®
Reset
< Back
Next >
Cancel


MARC 2008 Ver# 2.1.3 Setup
Ready to Install the Application
Click Next to begin installation.
Click the Back button to reenter the installation information or click Cancel to exit the wizard.
Wise Installation Wizard®
< Back
Next >
Cancel

f. Click on Next to begin the installation. The following screen appears while MARC 2008 is being installed:



g. Once MARC 2008 has been installed, the following message appears:

MARC 2008 Ver# 2.1.3 Setup
MARC 2008 Ver# 2.1.3 has been successfully installed.
Click the Finish button to exit this installation.
< Back
Finish
Cancel

h. Click the Finish button to exit the installation.

2.2 Starting MARC 2008

To start the MARC 2008 program, select the **Start** button from the taskbar followed by the **All Programs** submenu, and then click on MARC 2008.

2.3 Creating a Shortcut to MARC 2008

To create a shortcut on your desktop to run MARC 2008:

a. Click the start menu.
b. Locate the MARC 2008 program selection and right click on it.
c. Choose copy.
d. Locate to your desktop and right click on it.
e. Choose Paste Shortcut.

2.4 Entering Planner Information

The first time that MARC 2008 is run, the user will be prompted to enter information related to the manure management planner. At this time, the name of the manure management planner, the company and the contact information may be entered. As well, default units (metric, imperial, US) can be selected.

Click ***Save*** and then ***Next*** and the "New Farm – New Plan / Required Fields" sub-screen is displayed. When MARC 2008 is run the next time the planner information screen is not displayed.

3 Program Conventions

3.1 Program Structure

MARC 2008 divides the manure management plan into two components: the **Farm** and the **Land Application Plan**. The farm information is relatively "static" information that only needs to be entered once, but can be updated at any time. The plan information is more "dynamic" and must be entered for each land application plan. Each farm can have any number of plans associated with it. The plans are linked to the farm in the database. **As such, to move from a plan back to the farm information, the plan must be closed and the farm must be reopened.**

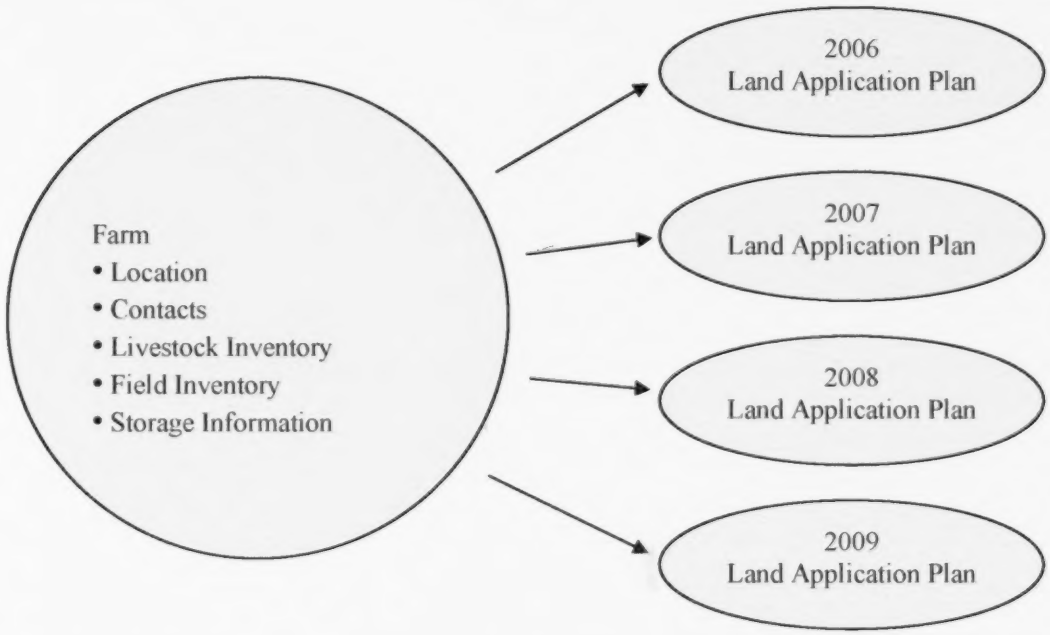


Figure 1: A conceptual picture of how the land application plan information is organized in MARC 2008.

3.1.1 The Farm

MARC 2008 contains a series of 5 screens that contain all of the information relating to the farm and a 6th screen for application calibration.

1. **Farm Info:** This screen (1/6) contains all of the farm location and contact information.

2. **Livestock:** This screen (2/6) creates an inventory of all of the livestock types and numbers on the farm. The livestock inventory is used to calculate the number of

animal units on the farm.

3. **Fields:** This screen (3/6) creates a complete list of all of the fields that are available, or could be available, for manure application.

4. **Storage:** This screen (4/6) creates a complete list of all of the manure storages that are associated with the farm.

5. **Plan List:** This screen (5/6) provides a list of all of the plans associated with the farm.

The farm contact information, livestock inventory, field inventory and manure storage information ***only need to be entered once***, but can be updated at any time. This information is stored separately from the plan information (similar to a separate file), although each of the plans is linked to the farm in the database. **As such, to move from a plan back to the farm information, the plan must be closed and the farm must be reopened.**

3.1.2 Calibration

The 6th screen in the series of farm screens provides a "stand alone" calculator to help with the calibration of equipment.

6. **Calibration:** This screen (6/6) provides calculations to assist with the calibration of the manure application equipment.

3.1.3 The Land Application Plan

MARC 2008 contains a series of 8 screens that contain all of the information for each land application plan. The screens include:

1. **Manure:** This screen (1/8) contains an inventory of all of the manures that are available for land application and their associated characteristics.

2. **Select Fields:** This screen (2/8) contains a complete list of all of the fields associated with this farm and identifies which fields have been selected for manure application in this plan.

3. **Crop:** This screen (3/8) contains cropping information for each field in the plan, including the crop to be grown, target yield, soil test results, nutrient recommendations and crop nutrient removals.

4. **Fertilizer:** This screen (4/8) contains all of the fertilizer application information. Fertilizer applications are deducted from the crop nutrient requirements.

5. **History:** This screen (5/8) includes all of the previous crop and previous manure application information that is required to calculate nitrogen credits *if the crop nitrogen recommendation was not based on a soil nitrate test.*

6. **Manure Application:** This screen (6/8) contains manure application information that is required to estimate the amount of N, P_2O_5 and K_2O that will be available from the manure application.

7. **Nutrient Summary:** This screen (7/8) calculates the rate of manure application and provides a nutrient summary and the final nutrient balance.

8. **Plan Summary:** This screen (8/8) provides a final summary of the manure and field information in the land application plan.

3.1.4 Moving between the Farm and the Plan

The farm information is automatically saved and closed when a plan is opened from the "Plan List" screen. **Due to the database structure, to move from the plan back to the farm information, the plan must first be saved and closed before the farm can be reopened.**

4 Program Conventions

4.1 Navigating the Program

Each screen has a ***Previous*** and ***Next*** button in the bottom right hand corner. To move through the program, enter the information on the screen displayed and then click on the ***Next*** button. To move to the previous screen, click on the ***Previous*** button.

Any screen can be accessed by clicking on the **folder tabs** along the top of the screen that is displayed. By clicking on the folder tabs, you can jump directly to any screen in the farm or plan. The screen number is displayed in the bottom right corner of each screen. For example, 4/8 indicates that the current screen is the fourth in a series of eight screens.

When entering information, input boxes can also be selected by placing the curser in the box and clicking the mouse. Alternatively, the ***Tab*** key can be used to move the cursor to the next logical input box and the ***Shift*** + ***Tab*** keys move the cursor to the previous input box.

4.2 Help Screens

Help information is provided at the bottom of every screen. The help information that is displayed pertains to the input box that is selected. The scroll bar on the side of the help information is often necessary to read all of the help information provided.

General help information for each screen is also provided. To access the general help, click on the folder tab label at the top of each screen (i.e. Manure, Select Fields, Crop, Fertilizer, etc.).

Help information can also be enlarged using the Help Icon found on the top right corner of the toolbar.

4.3 Changing Units

Units can be changed throughout the program. *Metric*, *Imperial* or *US* units are available. The only difference between *Imperial* and *US* units is the size of the gallon. The imperial gallon is expressed as "gal" whereas the US gallon is expressed as "US gal".

MARC 2008 saves the data in the database in metric units. Therefore, changing back and forth between units can result in small differences in the numbers that are displayed on the screen. This is simply due to unit conversions and rounding.

4.4 The Main Menu and Toolbar Functions

The main menu bar provides access to various basic functions through 2 options and their drop-down lists. The 2 options on the main menu bar are **File** and **Reports**. They are located in the top left corner of the screen.

4.4.1 File

There are 8 functions under the **File** drop-down list on the main menu bar. Some of these functions are also easily accessible through the icons on the toolbar. The functions include:

Main Menu: *New* **Toolbar Icon:**
This function allows you to **create a new farm or plan** through the "New Farm – New Plan/Required Fields" sub-screen.

Main Menu: *Open* **Toolbar Icon:**
This function allows you to **open an existing farm or plan** through the "Select a Farm or Plan" sub-screen. It can be used at any time in the program to jump back to the farm from the plan. **Due to the database structure, the plan must be closed before the farm can be opened.**

Main Menu: *Save* **Toolbar Icon:**
This function saves the current farm or plan information to the database.

Main Menu: *Save As* **Toolbar Icon: N/A**
This function provides the capability of saving an existing plan under a different name in the database. This can be used to minimize the amount of time required to re-enter information or to run various scenarios with an existing plan without making permanent changes to the original plan.

Main Menu: *Export* **Toolbar Icon: N/A**
This function allows you to export a plan. This facilitates the sharing of plans between users. For more information, see 4.4.4 Exporting a Plan.

Main Menu: *Import* **Toolbar Icon: N/A**
This function allows you to import a plan in database format. This facilitates the sharing of plans between users. For more information, see 4.4.5 Importing a Plan.

Main Menu: *Import MARC 2005 Files* **Toolbar Icon : N/A**
This function allows you to import all of your MARC 2005 farms and plans. For more information, see 4.4.6 Importing MARC 2005 Files.

Main Menu: *Planner* **Toolbar Icon: N/A**
This function displays the name and address of the manure management planner and the preferred units he/she has chosen to work in. The default units can be changed for **future** plans through the *Planner* information screen.

Main Menu: *Exit* **Toolbar Icon: N/A**
This function closes the program. A message prompts you to save any unsaved data. The 'X' in the top right corner of the screen also closes the program.

4.4.2 Additional Functions from the Toolbar

Cancel **Toolbar Icon:**
This function cancels any changes that have been made since the information was last saved.

Delete **Toolbar Icon:**
This icon **permanently deletes a farm or a plan from the database**. Before deleting a farm, a warning screen asks if you want to delete the current farm and all of the plans associated with the farm. Before deleting a plan, a warning screen asks if you want to delete the current plan.

Print Reports **Toolbar Icon:**
This icon allows you to print any of the reports for the farm or plan.

Units **Toolbar Icon:**

These icons allow you to work in metric (M), imperial (I) or US units. The units can be changed throughout the program.

Help **Toolbar Icon:**
This icon provides the help in a larger text box in the middle of the screen.

4.4.3 Reports

For more detailed information see Section 7 Manure Management Plan Reports.

Livestock operations that are 300 animal units or greater in size must submit annual manure management plans with Manitoba Conservation (Section 13 of the Livestock Manure and Mortalities Management Regulation, MR 42/98). MARC 2008 prints manure management plan forms for the farm and the land application plan. The reports printed by MARC 2008 cover all of the information required by Manitoba Conservation for the farm and the land application plan but they are not identical to the Manitoba Conservation forms. MARC 2008 automatically enters all of the data required for the farm and the land application plan. It also prints out a blank copy of the certification

form required by Manitoba Conservation. This form must be filled out manually by the user. **These reports have been approved by Manitoba Conservation.**

The following reports can be viewed from the **Reports** function on the main toolbar:
Farm Information
Animal Unit Inventory
Manure Storage Information
Manure Information
Application Summary
Certificate of Manure Management Plan
All Reports

To view example reports see Appendix C.

4.4.3.1 Printing Reports

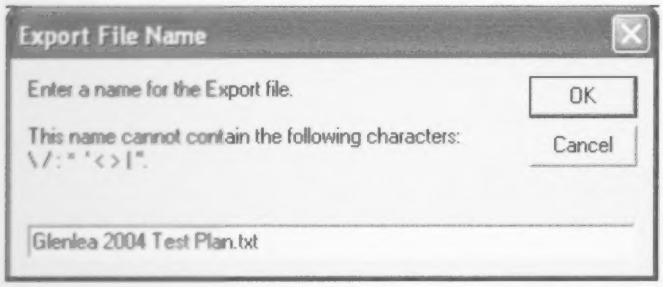
The reports can be printed individually or altogether using the *Print* icon on the main toolbar within the plan or using the *Print* icon on the toolbar within the report.

4.4.3.2 Saving Reports as PDF Files

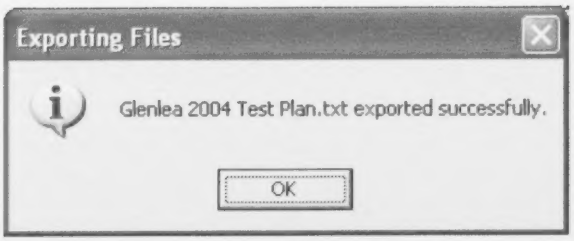
When you are in the reports, they can be saved as PDF files using the *Save Report as PDF* icon that is located in the main toolbar at the top of the screen. The PDF files will be saved to the Exports folder in the MARC directory. This function allows you to email to others the plan in the form of easy-to-read PDF reports.

4.4.4 Exporting a Plan

The data for a land application plan can be exported by using the Export function in the **File** drop-down list on the main menu bar. The data for the plan will be exported to the Exports folder in the MARC directory. A filename must be created for the export file. We recommend you include the **farm name**, the **year** and the **plan name** in the filename.

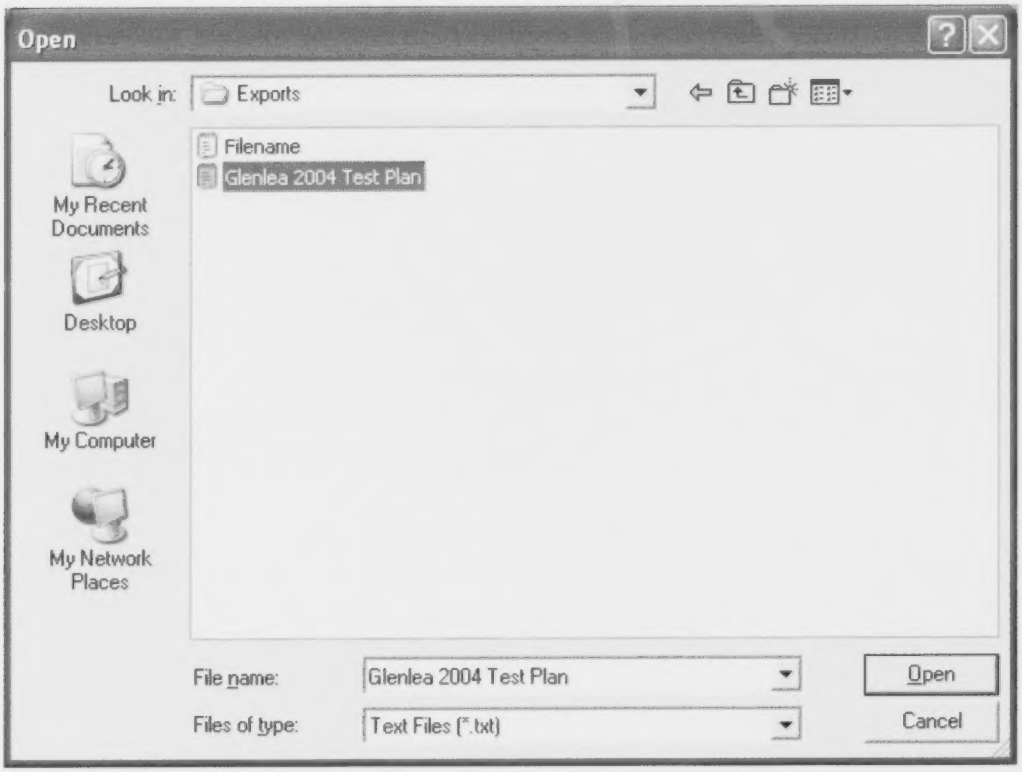

Export File Name
Enter a name for the Export file.
OK
This name cannot contain the following characters:
\ / : * ? " < > |
Cancel
Glenlea 2004 Test Plan.txt

Once you have entered the filename, click on the **OK** button. The plan will be exported as a **text file**. When the plan exports successfully, the following message appears:



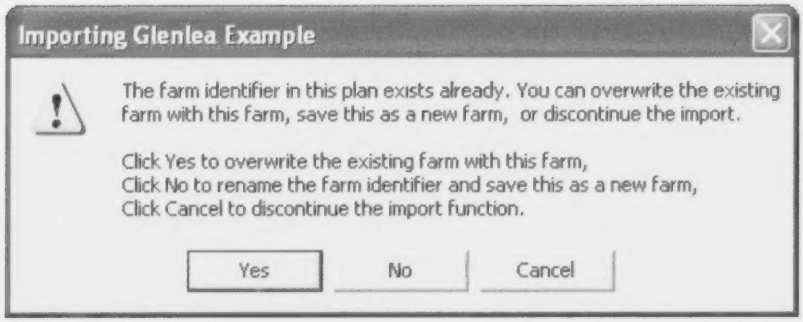
4.4.5 Importing a Plan

The exported text file for a land application plan can be imported by using the Import function in the **File** drop-down list on the main menu bar. Highlight that plan to be imported and click on the **Open** button.

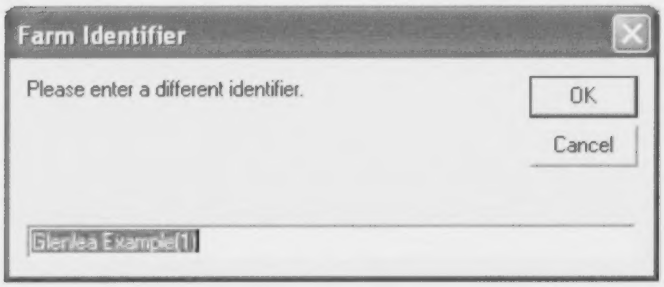


If the MARC database contains a farm with the same **farm identifier** as the farm in the plan being imported, MARC will prompt you to:

- overwrite the farm in the MARC database with the one that is being imported,
- rename the farm with a new farm identifier,
- or discontinue the import.

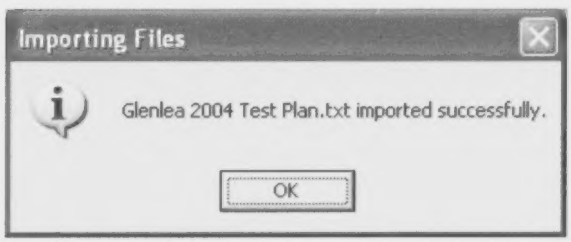

Importing Glenlea Example
The farm identifier in this plan exists already. You can overwrite the existing farm with this farm, save this as a new farm, or discontinue the import.
Click Yes to overwrite the existing farm with this farm,
Click No to rename the farm identifier and save this as a new farm,
Click Cancel to discontinue the import function.
Yes
No
Cancel

Click on **No** to change the farm identifier.



Enter a different identifier and click on **OK** to change the farm identifier on the plan being imported.

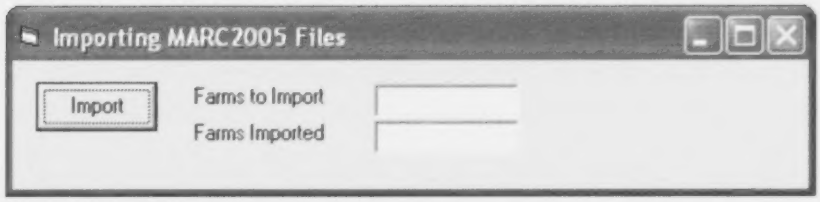
If the plan imports successfully, the following message will appear:



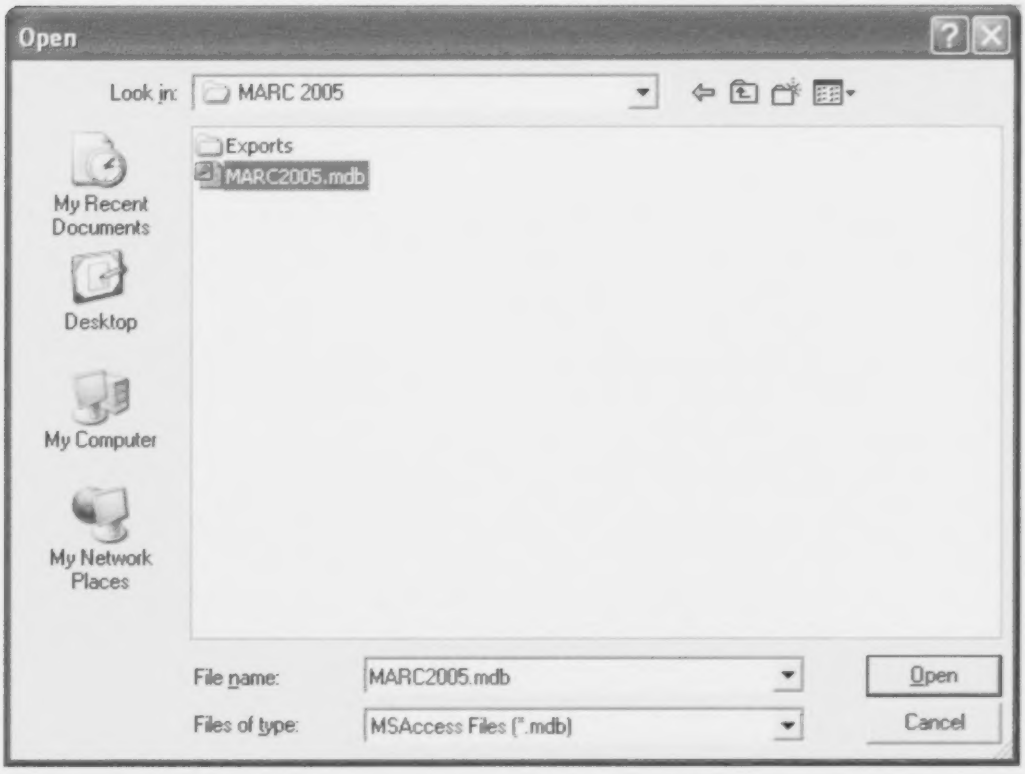
To open the plan, use the *Open* icon on the toolbar or the *Open* function in the **File** drop-down list on the main menu bar.

4.4.6 Importing MARC 2005 Files

Farms and plans from MARC 2005 can be imported by using the *Import MARC 2005 Files* function in the **File** drop-down list on the main menu bar. When the "Importing MARC 2005 Files" sub-screen appears, click on the **Import** button.

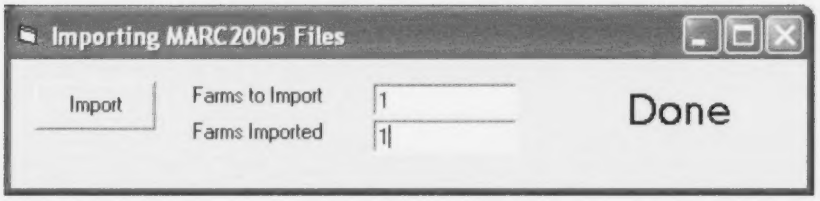


Highlight the MARC 2005 database to be imported (located in the MARC 2005 directory) and click on the **Open** button.



During the import, if field, livestock, plan or farm databank records do not exist for a farm, warnings messages may appear. Click on the **OK** button and the import will continue.

If the 2005 database imports successfully, the following message will appear:



To open a MARC 2005 farm or plan, use the *Open* icon on the toolbar or the *Open* function in the **File** drop-down list on the main menu bar to launch the "Select a Farm or Plan" sub-screen. If the MARC 2005 farms or plans do not appear in the Farm List or Plan List, **MARC 2008 may have to be closed and re-opened to access the imported 2005 files.**

5 Getting Started

5.1 Using MARC 2008 for the First Time

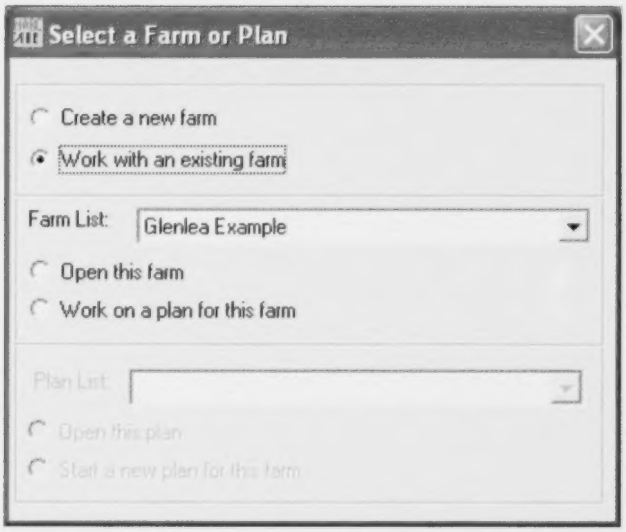
The first time you use MARC 2008, the "New Farm – New Plan / Required Fields" sub-screen will appear. Before you can create a manure management plan, the farm must be created. To create a new farm, enter a unique name for the farm in the **Identifier**, the **Legal Name** of the farm, the **Province** where the farm is located (i.e. Manitoba) and click on **OK**.

The farm **Identifier** is used to create and identify the database records for this farm (similar to a filename). The Identifier is needed to import and export a plan under a unique name.

5.2 Opening an Existing Farm or Creating a New Farm in MARC 2008

If there are one or more farms in the database, the "Select a Farm or Plan" sub-screen automatically appears when you enter MARC 2008. To create a new farm, click on the **Create a new farm** button. This will activate the "New Farm – New Plan / Required Fields" sub-screen.

To work on an existing farm, click on the **Work with an existing farm** button. This will automatically activate the farm list. The farm list contains all of the farms that are contained in the database. To open a farm, select the farm in the farm list and click on the **Open this farm** button.


Select a Farm or Plan
Create a new farm
Work with an existing farm
Farm List:
Glenlea Example
Open this farm
Work on a plan for this farm
Plan List:
Open this plan
Start a new plan for this farm

5.3 Opening an Existing Plan or Creating a New Plan in MARC 2008

To work on a plan for an existing farm, select the farm in the farm list and click on the **Work on a plan for this farm** button. This will activate a list of plans for the farm selected. To open a plan, select the plan in the plan list and click on the **Open this plan** button. To create a new plan for this farm, click on the **Start a new plan for this farm** button.

5.4 Opening a Farm or Plan from within MARC 2008

Any existing farm or plan can be opened at any time in the program by clicking on the *Open* icon or by using the **File**/*Open* option on the main menu bar.

Due to the database structure, to move from a plan back to the farm information, the plan must first be saved and closed before the farm can be opened.

5.5 Saving Information

Information can be saved at any time in the program by clicking on the *Save* Icon or by using the **File**/*Save* option on the main menu bar.

Regular saving of information is recommended.

The *Save As* function provides the capability of saving an existing plan under a different name in the database. This can be used to minimize the amount of time required to re-enter information or to run various scenarios with an existing plan without making permanent changes to the original plan.

5.6 Creating Lists

The "Livestock", "Fields", "Storage" and "Manure" screens in MARC 2008 all contain lists of information. The same convention has been used on all 4 screens to create and edit the lists.

To *add* an entry to the list, click on the **Add** button, enter the information and then click on the **Update List** button to load the information into the list.

To *edit* an entry in the list, highlight the entry in the list, edit the information in the input boxes and then click on the **Update List** button. To *cancel* the changes to the entry, click on the **Cancel** button.

To *delete* an entry, highlight the entry and click on the **Delete** button. This will delete the entry from the list.

6 MARC 2008 Data Entry

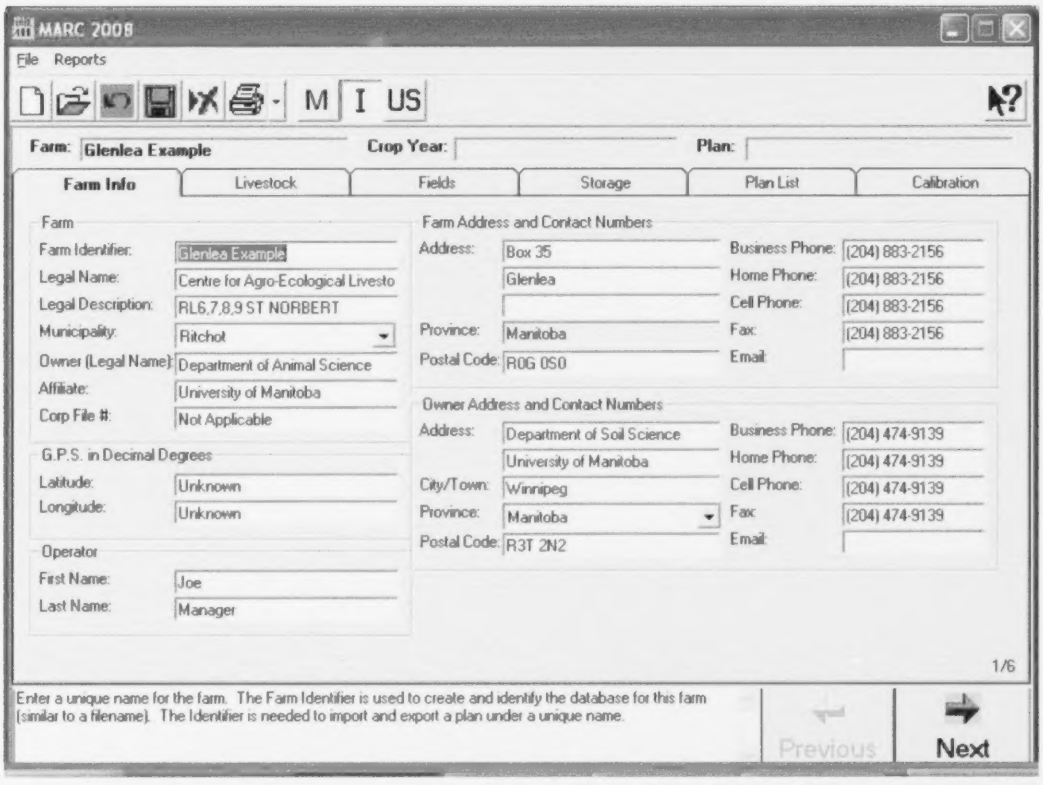
6.1 The Farm

MARC 2008 contains a series of 5 screens that contain all of the information relating to the farm, including Farm Info, Livestock, Fields, Storage and Plan List. The 6th screen in the series of farm screens provides a "stand alone" calculator to help with the calibration of equipment.

The farm contact information, livestock inventory, field inventory and storage information ***only need to be entered once***, but can be updated at any time. This information is stored separately from the plan information, although each of the plans is linked to the farm in the database.

6.1.1 The Farm Info Screen (1/6)

The "Farm Info" screen contains all of the farm location and contact information. The Farm **Legal Name** and the **Province** are used later in the program and must be saved in order to proceed through the program. The remaining fields are not required later in the program.

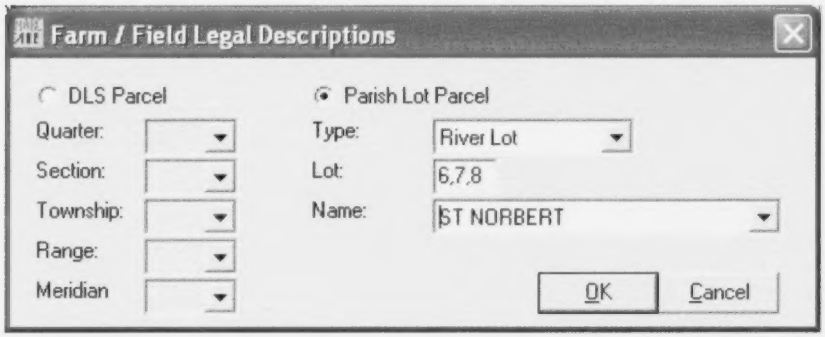


Farm Identifier: Enter a unique name for the farm. The farm identifier is used to create

and identify the database records for this farm (similar to a filename). The farm identifier is needed to import and export a plan under a unique name.

Legal Name: Enter the legal name of the operation. **This is the name of the operation on the manure management plan report.** The farm legal name is required in order to continue through the program.

Legal Description: Double clicking on the data entry box will activate the "Farm/Field Legal Descriptions" data entry sub-screen. A legal land description for the farm can be entered for a DLS parcel or for a Parish Lot (River Lot) parcel.



Municipality: Select the municipality in which the farm is located from the drop-down list.

Owner: Enter the name of the owner of the operation.

Affiliate: Enter the name of any corporation with which the farm is affiliated.

Corporate File #: Enter the corporate file number for the farm, if applicable.

G.P.S. in Decimal Degrees: Enter the G.P.S. coordinates for the farm, if available.

Operator: Enter the name of the farm operator or manager. **This is the contact name on the manure management plan report.**

Farm Address and Contact Numbers: Enter the farm address and contact information.

Owner Address and Contact Numbers: Enter the owner's address and contact information.

Once you have entered the farm information, click on the ***Next*** button to continue. The program will automatically prompt you to save your information. If you do not save the farm information, all changes that were made since you last saved will be lost.

6.1.2 The Livestock Screen (2/6)

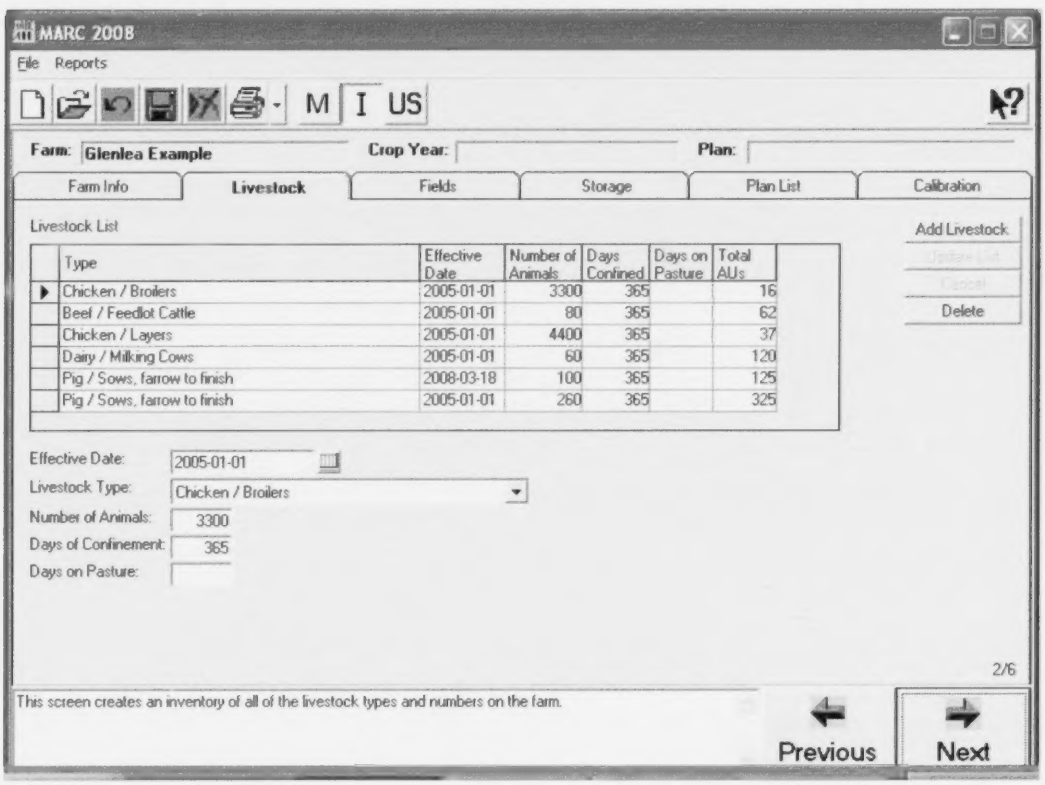
The "Livestock" screen creates an inventory of all of the livestock types and numbers on

the farm. The livestock inventory is used to calculate the number of animal units on the farm. Changing production systems can result in changing livestock numbers on the farm. If there is more than one entry for a livestock type, the most recent entry is used to calculate and print the number of animal units on the manure management plan reports.

To *add* livestock data to the livestock list, click on the **Add Livestock** button, enter the livestock information and then click on the **Update List** button to load the livestock information into the livestock list. To *cancel* a new entry, click on the **Cancel** button.

To *edit* a livestock entry, highlight the entry in the livestock list, edit the livestock information in the input boxes below and then click on the **Update List** button. To *cancel* the changes, click on the **Cancel** button.

To *delete* a livestock entry, highlight the entry and click on the **Delete** button. This will delete the livestock entry from the livestock list.



Effective Date: The effective date reflects the type and number of livestock on the farm on the date that is entered.

Changing production systems can result in changing livestock numbers on the farm. If there is more than one entry for a livestock type, the most recent numbers will be used to

calculate and print the number of animal units for that livestock type on the manure management plan reports.

Livestock Type: Select the livestock type on the farm from the drop-down list. For farms with multiple livestock types, one record can be created for each type.

Number of Animals: Enter the number of animals for the specified livestock type. For housing systems, the number of livestock corresponds to the number of animal places in the barn or housing system (i.e. capacity, not the number of animals marketed in a year).

Days of Confinement or on Pasture: Specifying the number of days of confinement or the number of days on pasture is **optional**.

Enter the number of days that the livestock are confined and manure is collected and stored for land application in the **Days of Confinement** input box. Enter the number of days that the livestock are on pasture and manure is not collected and stored for land application in the **Days on Pasture** input box.

When you have entered all of the livestock information, make sure you have updated the livestock list and then click on the ***Next*** button to continue through the program.

6.1.3 The Fields Screen (3/6)

The "Fields" screen contains a list of all of the fields that are available, or could be available, for manure application. **There must be at least one field in the field list in order to create a land application plan.**

To *add* a new field, click on the **Add Field** button, enter the field information and then click on the **Update List** button to load the field into the field list. To *cancel* a new entry, click on the **Cancel** button.

To *edit* a field, highlight the field in the field list, edit the field information in the input boxes and then click on the **Update List** button. To *cancel* the changes, click on the **Cancel** button.

To *delete* a field, highlight the field and click on the **Delete** button. A prompt will ask if you want to delete the field from the farm. Fields that have been used in previous land application plans cannot be deleted from the farm.

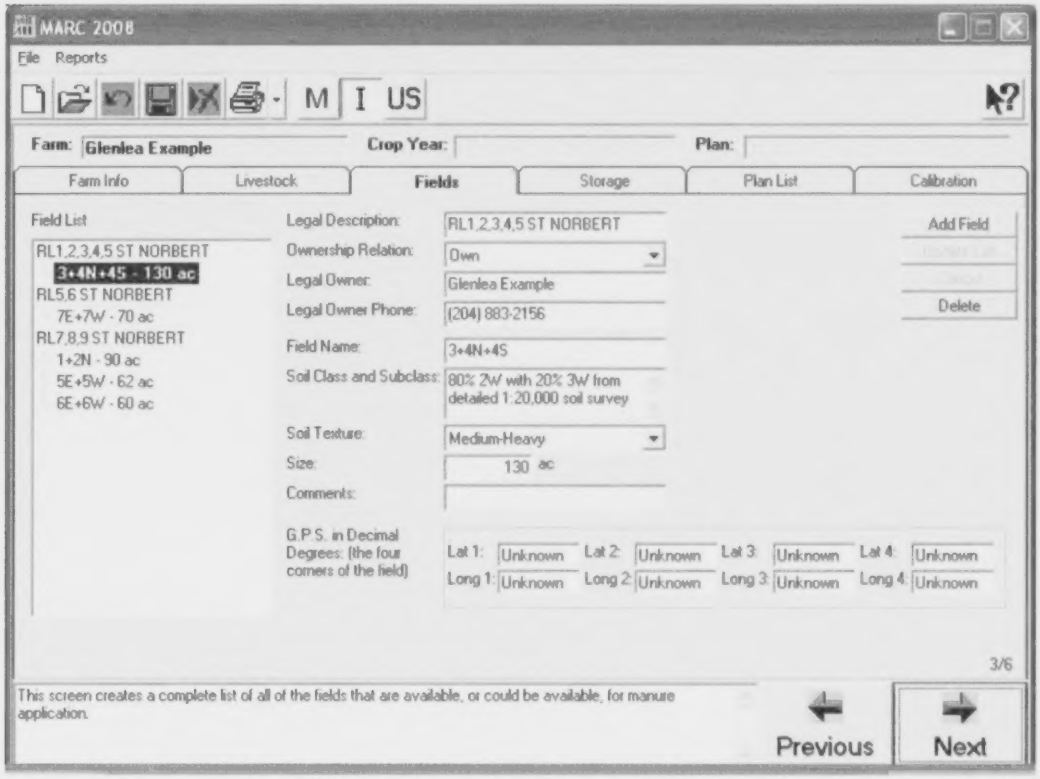
Legal Description: Double clicking on the data entry box will activate the "Farm/field legal descriptions" data entry sub-screen. A legal land description can be entered for each parcel of land that is associated with the farm and could be available for manure application.

Ownership Relation: Select from the drop-down list whether the parcel of land is owned by the livestock operation, under a lease or rental agreement for crop production or under an agreement with a neighbour to receive manure only.

Legal Owner: Enter the legal owner of the parcel of land. If the parcel of land is owned by the livestock operation, the legal name of the farm is automatically entered in the **Legal Owner** input box.

Legal Owner Phone: Enter the telephone number for the legal owner of the parcel of land. If the parcel of land is owned by the livestock operation, the business telephone number for the farm is automatically entered in the **Legal Owner Phone** input box.

Field Name: Enter a field name for each field within the legal description. If a parcel of land is divided into more than one field, each field can be entered separately and identified with a unique name.



Soil Class and Subclass: Enter the Soil Class(es) and Subclass(es) for the field using the Canada Land Inventory (CLI) Agriculture Capability rating system. Include the source (e.g. report #, website) and scale of the information (e.g. 1:20,000 or 1:125,000).

The most detailed scale of information available should always be used. If there is more than one soil rating per field, list the ratings from the most dominant in the field to the least dominant.

There are 7 classes (1-7) in the CLI Agriculture Capability rating system that indicate the severity of limitations to dryland crop production. The subclasses indicate the type of

limitation and include climate (C), depth to bedrock (R), moisture (M), topography (T), inundation (I), wetness (W) ,density (D), salinity (N), stoniness (P) and erosion (E). See Appendix B for the CLI Agriculture Capability Table.

Soil Texture: Select the soil texture for each field from the drop-down list. Soil textures are grouped into two categories: Light and Medium/Heavy. Light textures include sandy loam, loamy sand and sand. Medium/Heavy textures include silt, silty loam, loam, sandy clay loam, heavy clay, silty clay, clay, clay loam.

Size: Enter the size of the field corresponding to the field name.

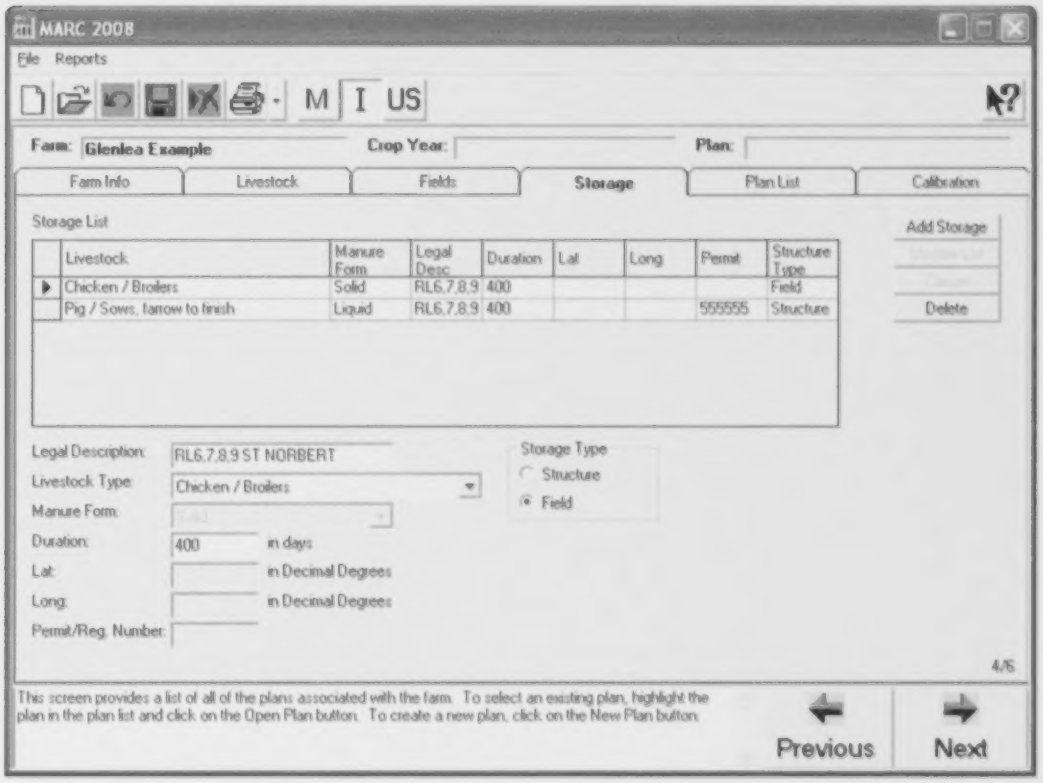
Comments: Enter any specific comments about the field that should be recorded.

G.P.S in Decimal Degrees: Enter the G.P.S. coordinates for the field, if available.

When you have entered all of the field information, click on the ***Next*** button to continue through the program.

6.1.4 The Manure Storage Screen (4/6)

The "Storage" screen provides a list of all of the manure storages associated with the farm.



To *add* a new storage, click on the **Add Storage** button, enter the storage information and then click on the **Update List** button to load the storage into the storage list. To *cancel* a new entry, click on the **Cancel** button.

To *edit* a storage, highlight the storage in the storage list, edit the storage information in the input boxes and then click on the **Update List** button. To *cancel* the changes, click on the **Cancel** button.

To *delete* a storage, highlight the storage and click on the **Delete** button. A prompt will ask if you want to delete the storage from the farm.

Legal Description: Double clicking on the data entry box will activate the "Farm/field legal descriptions" data entry screen. A legal land description can be entered for each manure storage associated with the farm.

Storage Type: Click on either the **Structure** or **Field** button to select the type of storage. The **Structure** button applies to registered or permitted manure storage facilities for liquid or solid manure. The **Field** button applies to solid manure only that is temporarily stored in the field prior to land application.

Manure Type: Select from the drop-down list the type of livestock manure that is stored.

Manure Form: Select from the drop-down list the form of manure. As a guideline, according to the Manitoba Conservation Manure Management Plan forms, liquid manure is pumped as a liquid and is typically <5% dry matter. Semi-solid manure is paste-like and has 5-25% dry matter. Solid manure is handled with a loader and has >25% dry matter.

Duration: Enter the duration (i.e. capacity) of the storage in days.

Lat: Enter the G.P.S. coordinates for the field, if available.

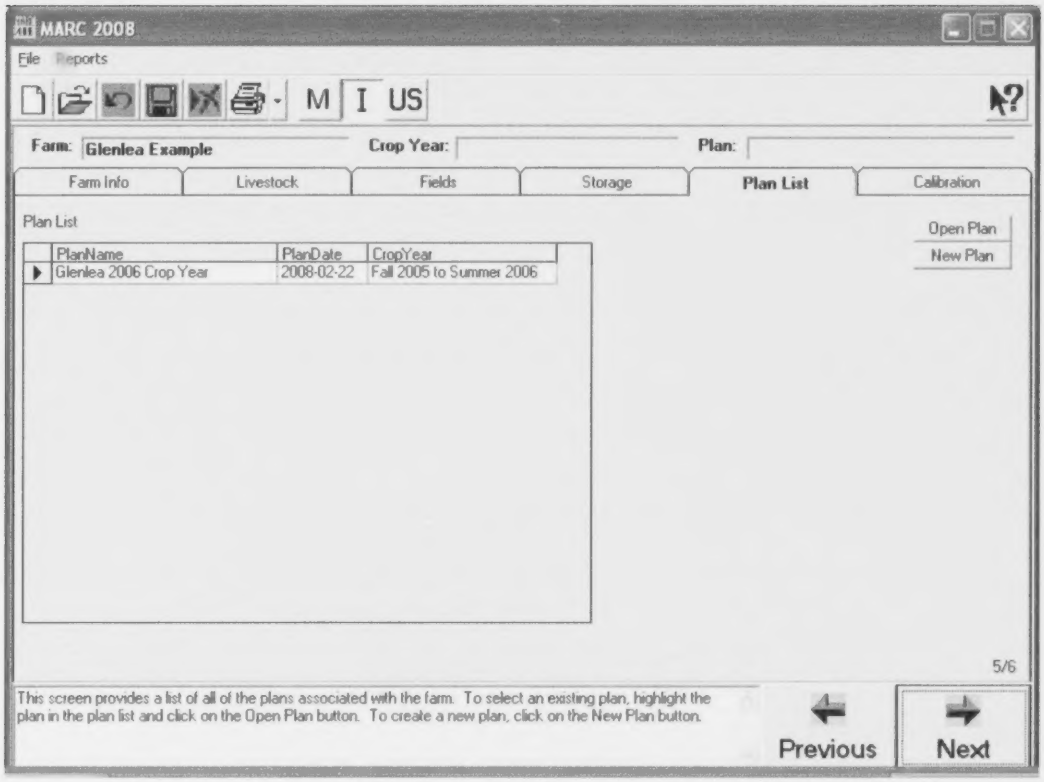
Long: Enter the G.P.S. coordinates for the field, if available.

Permit/Reg. Number: Enter the Manitoba Conservation permit or registration number for the manure storage facility.

6.1.5 The Plan List Screen (5/6)

The "Plan List" screen provides a list of all of the land application plans associated with the farm.

To open an existing land application plan, highlight the plan in the plan list and click on the **Open Plan** button.



To create a new land application plan, click on the **New Plan** button. This will activate the "New Plan / Required Fields" sub-screen.

Plan Creation Date: The current date is automatically entered in the **Plan Creation Date** input box.

Plan Name: Enter a name for the land application plan.

Farm: The farm you are currently working in is automatically entered in the **Farm** input box. However, a new plan can be linked to any farm in the farm list.

Crop Year: Select the appropriate crop year for the land application plan. The crop year follows fertilization practices and is not the same as a calendar year. Fall applications of manure fertilize the crop for the following growing season. Therefore, the crop year extends from the fall of one year to the end of the summer in the following year.

When you have entered all of the new plan information, click on the **OK** button to continue through the program.

6.1.6 The Calibration Screen (6/6)

The "Calibration" screen is a stand-alone screen which provides calculations to assist in the calibration of the manure application equipment.

Calibration Type: In order to calculate the speed or rate, the **Speed** or **Rate** button must be chosen, respectively.

Manure Form: Select either **Solid** or **Liquid** manure using the **Manure Form** buttons.

Equipment: Identify the type of equipment that will be used to land apply the manure.

Method: The method of manure application determines the information necessary to calibrate the manure application system. The following options are available:

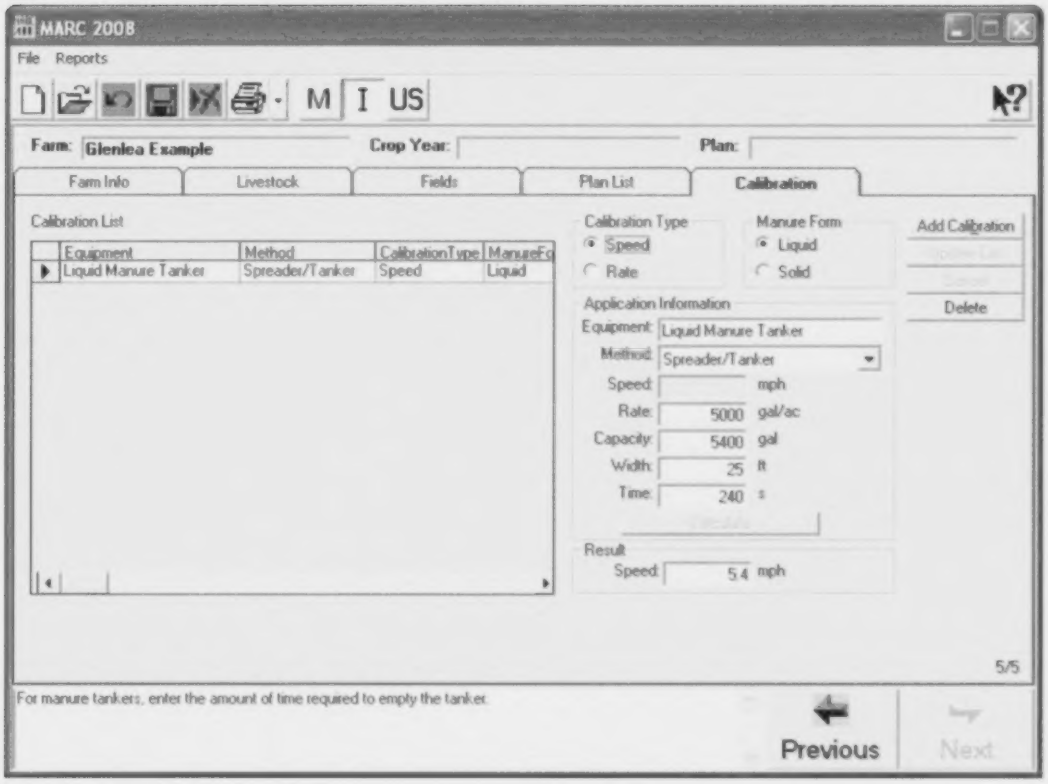
- Spreader/Tanker
- Tractor pulled flexible hose
- Irrigation System

If solid manure was previously indicated, only the Spreader/Tanker option is available.

Select the method of manure application.

Speed: If the application rate is to be calculated, the application speed must be entered.

Rate: If the application speed is to be calculated, the target application rate must be entered.



Capacity: Enter the capacity of the land application equipment.

The actual volume that is contained in a liquid manure tanker is often less than the manufacturer's rated volume. The actual volume in a full load is about 90 % of the manufacturer's rated volume.

For solid manure spreaders, the "capacity" of the solid manure spreader is:

Capacity (short ton) = manure volume (ft^3) x manure density (lb/ft^3) ÷ 2000 lb/short ton
or
Capacity (tonne) = manure volume (m^3) x manure density (kg/m^3) ÷ 1000 kg/tonne

The density of solid manure ranges from 400-960 kg/m^3 (25-60 lb/ft^3).

Width: Enter the width of manure application from one pass of the manure application equipment.

Time: Enter the length of time that it takes to apply one load of manure. When determining the length of time it takes to apply one load, do not include the time at the end of the load when the application rate decreases. This input is only required for the Spreader/Tanker method of application.

Calculate: Click on the **Calculate** button to produce the result based on the input information.

6.2 The Land Application Plan

MARC 2008 contains a series of 8 screens that contain all of the information for each land application plan.

6.2.1 The Manure Screen (1/8)

The "Manure" screen contains all of the information regarding the manure(s) that are available for land application.

To *add* a manure to the manure list, click on **Add Manure**, enter all of the manure information on the screen and click on **Update List** to load the manure information into the manure list. To *cancel* a new entry, click on the **Cancel** button.

To *edit* a manure in the manure list, highlight the manure, edit the manure information in the input boxes below and then click on the **Update List** button to load the new information into the manure list. To *cancel* the changes, click on the **Cancel** button.

To *delete* a manure from the manure list, highlight the manure and click on **Delete**.

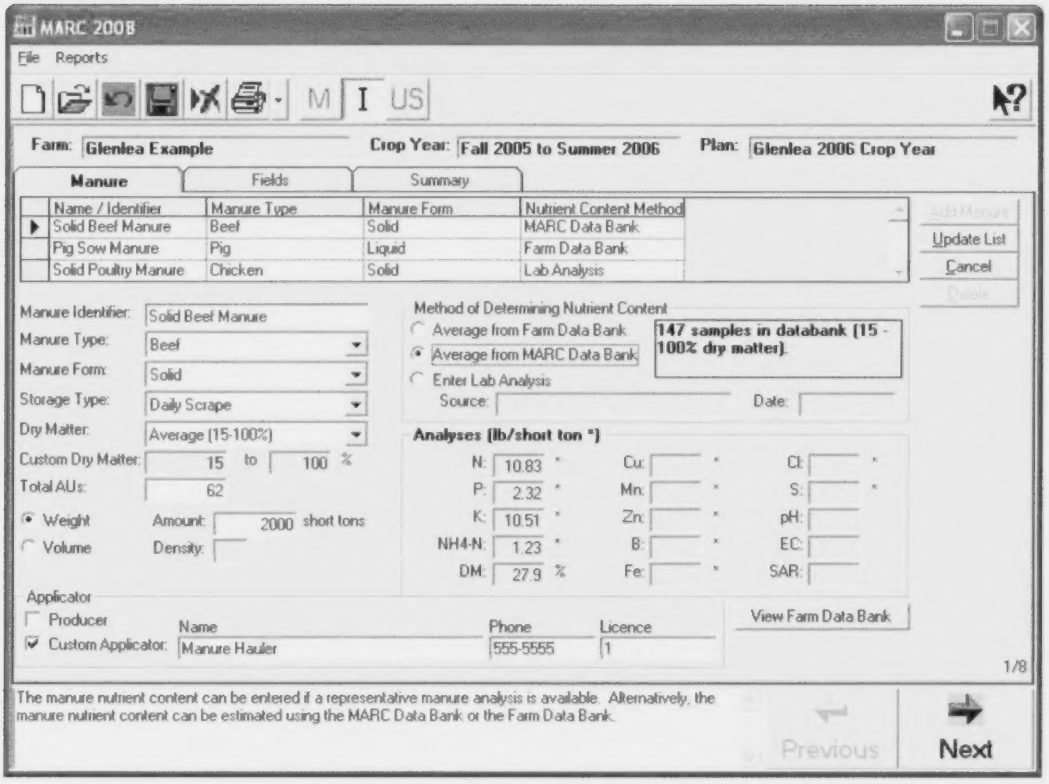
6.2.1.1 General Properties

The general properties of the manure include the manure identifier, type, form, storage type, dry matter content, amount and applicator.

Manure Identifier:
Enter a unique name or identifier for each type of manure to be land applied. This name will allow you to identify which manure you want to land apply later in the program. Including the livestock type (e.g. pig, chicken, dairy etc.) in the manure identifier is recommended, particularly if one of the "Other" options is chosen under the **Manure Type**.

Manure Type:
Select the type of manure that is to be land applied from the drop-down list. Identifying the type of manure by livestock type (dairy, beef, pig, chicken etc.) is required on the Manitoba Conservation manure management plan forms.

If you want to create a farm database for different manure types within one livestock type (e.g. sow manure versus feeder pig manure), one of the "Other" options can be used. When using one of the "Other" options, **enter the livestock type in the manure identifier** (e.g. Pig Sow Manure versus Pig Feeder Manure). This is what will print on the manure management plan reports. A maximum of 3 "Other" manure types can be recorded per farm.



Manure Form:
Select the form of the manure, either solid or liquid, from the drop-down list. The form of manure relates to how the manure will be land applied (i.e. either as a solid manure or a liquid manure.)

The form of the manure determines the dry matter ranges provided in the **Dry Matter** drop-down list. In general, liquid manure ranges from 0 to 15% dry matter, while solid manure ranges from 15 to 100% dry matter.

The dry matter range specified is used to calculate the average nutrient content of the manure using the **MARC** or **Farm Data Banks**. A specific dry matter range can be specified using the "Custom" option in the dry matter drop-down list.

Storage Type:
Select the type of storage that is being used from the drop-down list.

Dry Matter:
Select the dry matter range that best represents the manure that is to be land applied. Alternately, a specific dry matter range can be entered using the "Custom" option.

Total AUs:
The number of animal units (AU) that has triggered the requirement for submitting a

manure management plan is required on the Manitoba Conservation manure management plan forms. The total number of AU can be obtained from the Animal Unit Inventory report, which can be accessed through the **Reports** drop-down list on the main menu bar.

Amount:
Enter the total amount of manure to be land applied during this crop year. The amount of manure can be entered as a either a **Volume** (most often used for liquid manure) or **Weight** (for solid manure). To convert from a volume to a weight for solid manure, the **Density** of the manure must be entered.

If liquid manure is selected, the amount of manure defaults to the volume option. If you select the weight option, a density of 1 kg/L or 10 lb/gal can be used.

If solid manure is selected, the amount of manure defaults to the weight option. If the volume option is selected, the density of manure must be entered. The density of solid manure ranges from 400-960 kg/m^3 (25-60 lb/ft^3).

Applicator:
Use the check boxes to indicate whether the manure will be land applied by the producer or a custom manure applicator or both. If a custom manure applicator will land apply the manure, identify which custom manure applicator.

Under *The Pesticides and Fertilizers Control Act* in Manitoba, custom manure applicators are required to be trained and licensed with Manitoba Agriculture, Food and Rural Initiatives.

6.2.1.2 Options for Determining the Nutrient Content of Manure:
There are three options for determining the nutrient content of manure. They are:

- **Average from Farm Data Bank;**
- **Average from MARC Data Bank;** or
- **Enter Lab Analysis**.

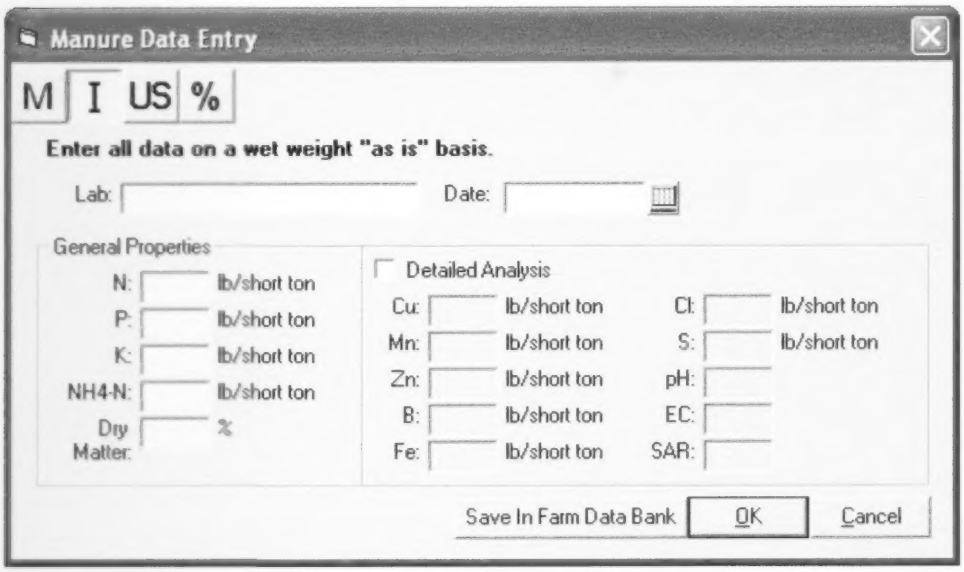
Average from Farm Data Bank:
When the **Average from Farm Data Bank** option is selected, the nutrient values for the manure are calculated using the data in the farm data bank. Data matching the manure type and dry matter range (as identified in the general properties) are averaged and inserted in the analyses boxes. The number of samples that make up the averages is displayed. If there are no records in the farm data bank to create the averages, either the MARC data bank or a manure analysis will have to be used.

Average from MARC Data Bank:
When the **Average from MARC Data Bank** option is selected, the nutrient values for the manure are calculated using the data in the MARC data bank. Data matching the manure type and dry matter range (as identified in the general properties) are averaged and inserted in the analyses boxes. The number of samples that make up the averages is displayed. If there are no records in the MARC data bank to create the averages, either

the farm data bank or a manure analysis will have to be used.

Enter Lab Analysis:
Manure analyses can be entered into the farm data bank through the **Enter Lab Analysis** option. The **Enter Lab Analysis** option activates the "Manure Data Entry" screen where manure nutrient values from an actual lab analysis can be entered.

When entering manure data, remember to check your units.



Analyses:
N is the total amount of nitrogen contained in the manure. The total nitrogen (N) content of the manure will always be greater than the ammonium-nitrogen (NH_4-N).

P is the total amount of phosphorus contained in the manure. The total phosphorus (P) value must be entered as elemental P. If the lab analysis report expresses the phosphorus content of the manure as P_2O_5, divide the P_2O_5 value by 2.3 to give you elemental P.

K is the total amount of potassium contained in the manure. The total potassium (K) value must be entered as elemental K. If the lab analysis report expresses the potassium content of the manure as K_2O, divide the K_2O value by 1.2 to give you elemental K.

NH_4-N is the ammonium-nitrogen contained in the manure. Ammonium-nitrogen is considered to be immediately available for crop use.

DM is the dry matter content of the manure. If the MARC or Farm Databank was used to estimate the dry matter content of the manure, it is the average dry matter for all of the sample data in the databank that fall within the range specified.

Cu is the total amount of copper contained in the manure.

Mn is the total amount of manganese contained in the manure.

Zn is the total amount of zinc contained in the manure.

B is the total amount of boron contained in the manure.

Fe is the total amount of iron contained in the manure.

Cl is the total amount of chloride contained in the manure.

S is the total amount of sulphur contained in the manure.

pH is a measure of the acidity or alkalinity of the manure.

EC is the electrical conductivity of the manure.

SAR is the sodium absorption ratio of the manure.

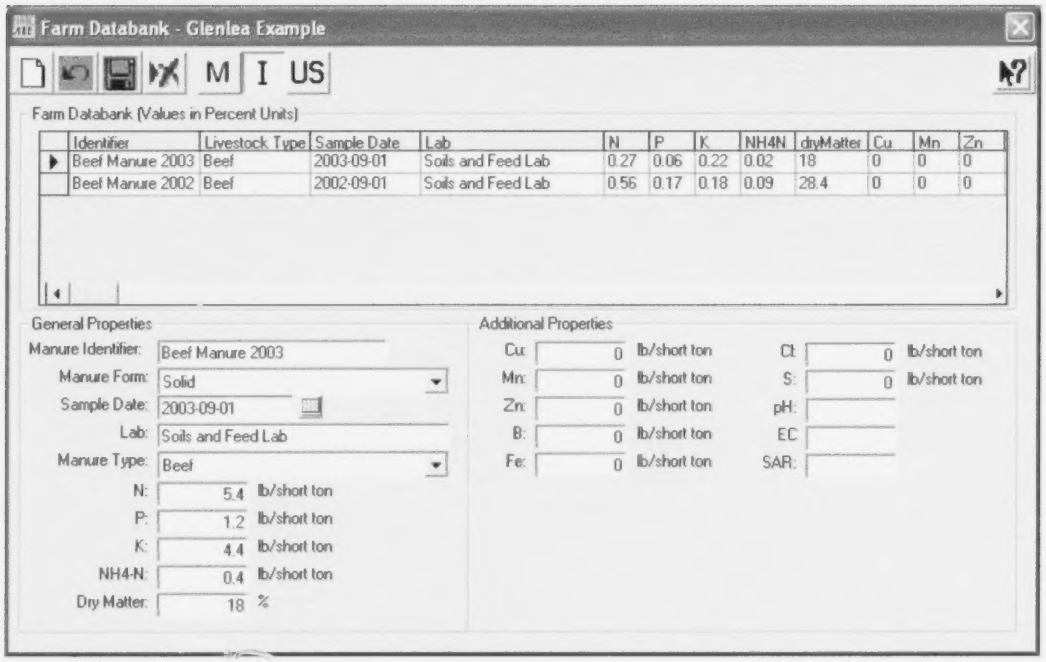
The lab analyses can be used directly or they can be saved in the farm data bank and then used to calculate the average of the data in the farm data bank.

To use the lab analyses directly, click on the **OK** button on the "Manure Data Entry" screen.

To save the lab analyses to the farm data bank, click on the **Save in Farm Data Bank** button on the "Manure Data Entry" screen.

When you have entered all of the manure information, make sure you have updated the manure list and then click on the ***Next*** button to continue through the program.

Entering Data through the View Farm Data Bank Option:
Manure analyses can also be entered through the **View Farm Data Bank** button. The **View Farm Data Bank** button activates the "Farm Data Bank" screen. New analyses can be entered on this screen by using the *New* and *Save* icons on the main menu.


Farm Databank - Glenlea Example
M I US
Farm Databank (Values in Percent Units)
Identifier | Livestock Type | Sample Date | Lab | N | P | K | NH4N | dryMatter | Cu | Mn | Zn
Beef Manure 2003 | Beef | 2003-09-01 | Soils and Feed Lab | 0.27 | 0.06 | 0.22 | 0.02 | 18 | 0 | 0 | 0
Beef Manure 2002 | Beef | 2002-09-01 | Soils and Feed Lab | 0.56 | 0.17 | 0.18 | 0.09 | 28.4 | 0 | 0 | 0
General Properties
Manure Identifier: Beef Manure 2003
Manure Form: Solid
Sample Date: 2003-09-01
Lab: Soils and Feed Lab
Manure Type: Beef
N: 5.4 lb/short ton
P: 1.2 lb/short ton
K: 4.4 lb/short ton
NH4-N: 0.4 lb/short ton
Dry Matter: 18 %
Additional Properties
Cu: 0 lb/short ton
Mn: 0 lb/short ton
Zn: 0 lb/short ton
B: 0 lb/short ton
Fe: 0 lb/short ton
Cl: 0 lb/short ton
S: 0 lb/short ton
pH:
EC:
SAR:

6.2.2 The Select Fields Screen (2/8)

The "Select Fields" screen allows you to select the fields that will receive manure in this land application plan. The field list was created in the Farm and contains all of the fields that are associated with the farm and could be available for manure application.

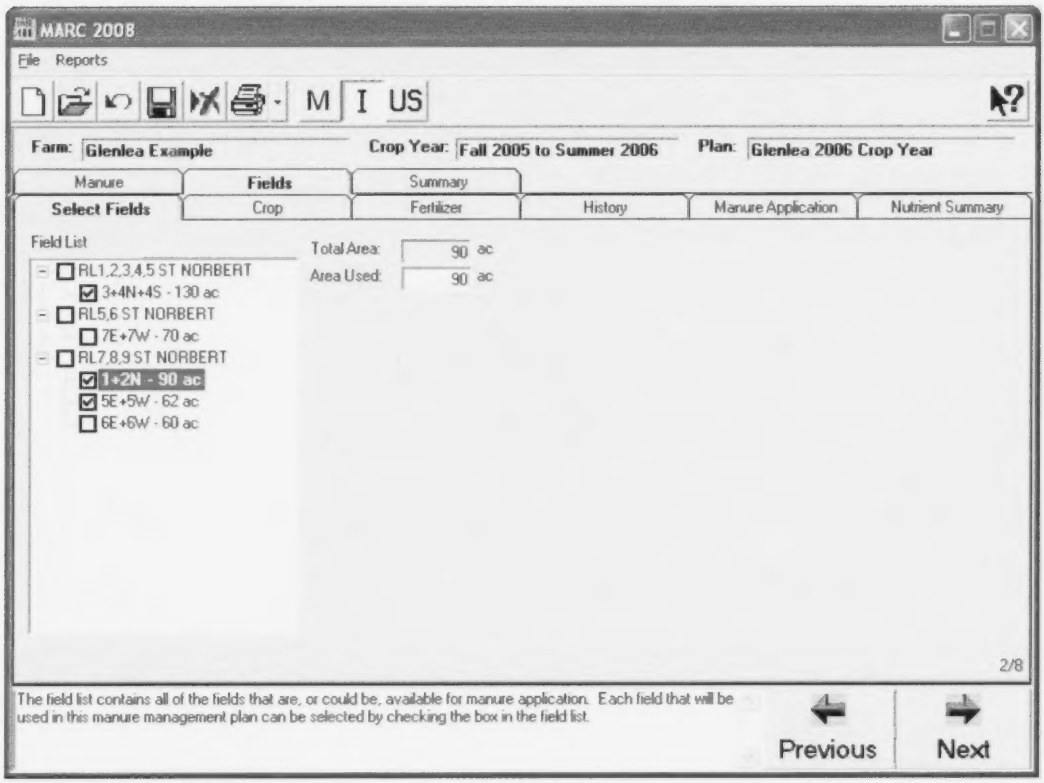
Select each field that will be used in the land application plan by checking the box in the field list.

To *add* a field to the field list, you must close the plan and return to the "Fields" screen in the farm information.

Total Area:
This is the total area of the field highlighted.

Area Used:
Enter the field area that is available for land application of manure. This area must exclude the area within setbacks, buffer strips, water bodies etc. and cannot be larger than the total area of the field.

Once you have selected the fields that will receive manure, click on the ***Next*** button to continue through the program.



6.2.3 The Crop Screen (3/8)

The "Crop" screen contains cropping information including the crop nutrient requirements. The crop nutrient requirements should be based on soil test results.

Crop:

Select the crop to be grown from the drop-down list for the field highlighted in the field list. The specified crop for each field will appear throughout the remainder of the program at the bottom of the field list for whichever field is highlighted.

Target Yield:

Enter a realistic target yield for the crop specified and select the appropriate units. The target yield should be the basis of the crop nutrient recommendations.

Based on Soil Test and Lab or Provincial Recommendations:

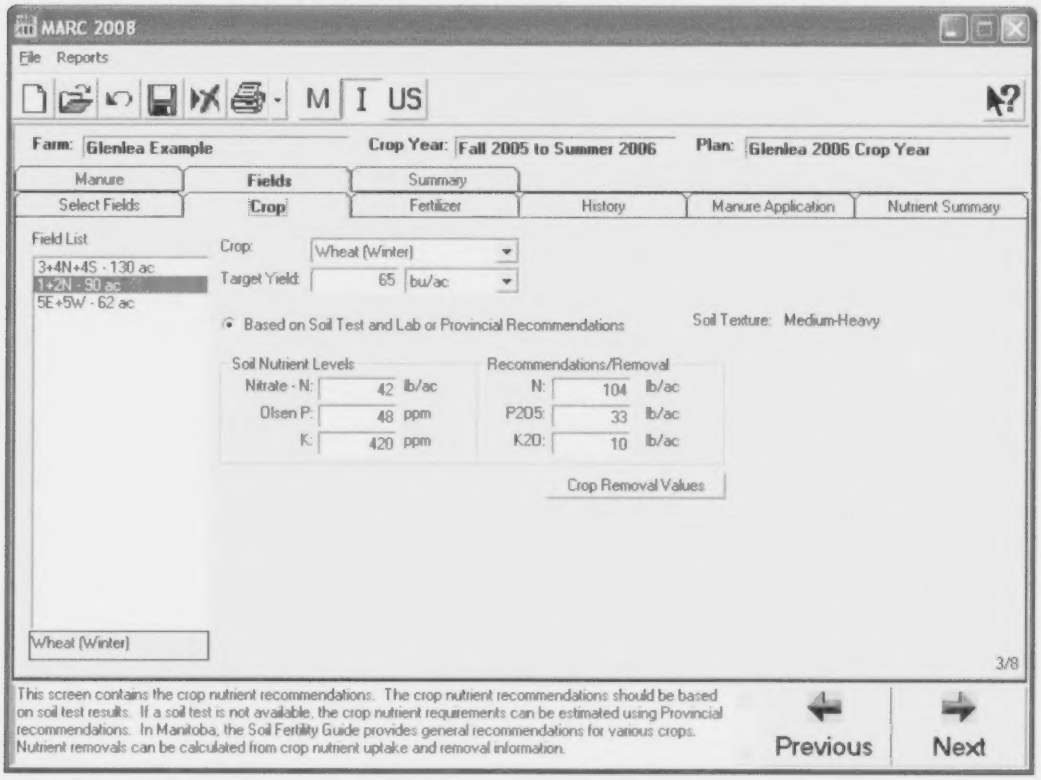
If a soil test is available, enter the **Soil Nutrient Levels** and the nutrient **Recommendations** from the lab report. Alternatively, the soil test results and a realistic target yield can be used to establish fertilizer recommendations using the Manitoba Soil Fertility Guide.

The soil analysis results for nitrate-nitrogen (NO_3-N) should be from a representative sample of the top 60 cm (2 feet) of soil. **Nitrate-N** must be entered in lb/ac (imperial) or

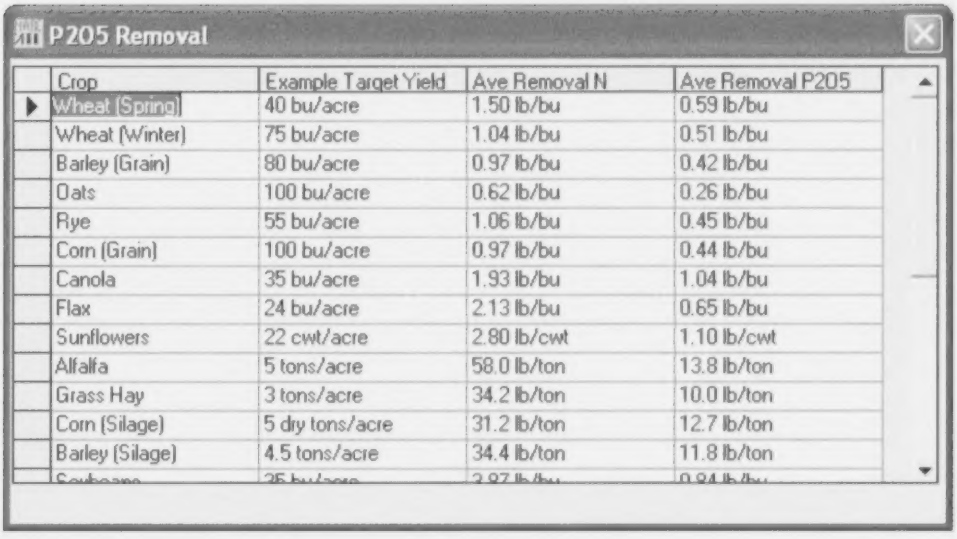
kg/ha (metric). Remember to check your units.

The soil analysis results for phosphorus (P) should be from a representative sample of the top 15 cm (6-inches) of soil that has been analysed using the sodium bicarbonate method of extraction (or Olsen P). **Olsen P** must be entered in ppm. Remember to check your units.

The soil analysis results for potassium (**K**) should be from a representative sample of the top 15 cm (6-inches) of soil. Potassium must be entered in ppm. Remember to check your units.


MARC 2008
File Reports
M I US
Farm: Glenlea Example
Crop Year: Fall 2005 to Summer 2006
Plan: Glenlea 2006 Crop Year
Manure
Fields
Summary
Select Fields
Crop
Fertilizer
History
Manure Application
Nutrient Summary
Field List
3+4N+4S - 130 ac
1+2N - 90 ac
5E+5W - 62 ac
Crop: Wheat (Winter)
Target Yield: 65 bu/ac
Based on Soil Test and Lab or Provincial Recommendations
Soil Texture: Medium-Heavy
Soil Nutrient Levels
Nitrate - N: 42 lb/ac
Olsen P: 48 ppm
K: 420 ppm
Recommendations/Removal
N: 104 lb/ac
P2O5: 33 lb/ac
K2O: 10 lb/ac
Crop Removal Values
Wheat (Winter)
3/8
This screen contains the crop nutrient recommendations. The crop nutrient recommendations should be based on soil test results. If a soil test is not available, the crop nutrient requirements can be estimated using Provincial recommendations. In Manitoba, the Soil Fertility Guide provides general recommendations for various crops. Nutrient removals can be calculated from crop nutrient uptake and removal information.
Previous
Next

Crop Removal Values:
For soils with very high phosphorus (P) levels, the manure P_2O_5 application rate should not exceed crop removal of P_2O_5. Crop nutrient removal values for phosphorus can be calculated manually using the **Crop Removal Values** button. The **Crop Removal Values** button activates crop "P_2O_5 Removal" sub-screen. This screen provides example yields for each of the major crops grown in Manitoba and P_2O_5 removals per unit yield. **Crop P_2O_5 removal per acre can be calculated manually by multiplying a farm's historical average yield by the P_2O_5 removal per unit yield.**



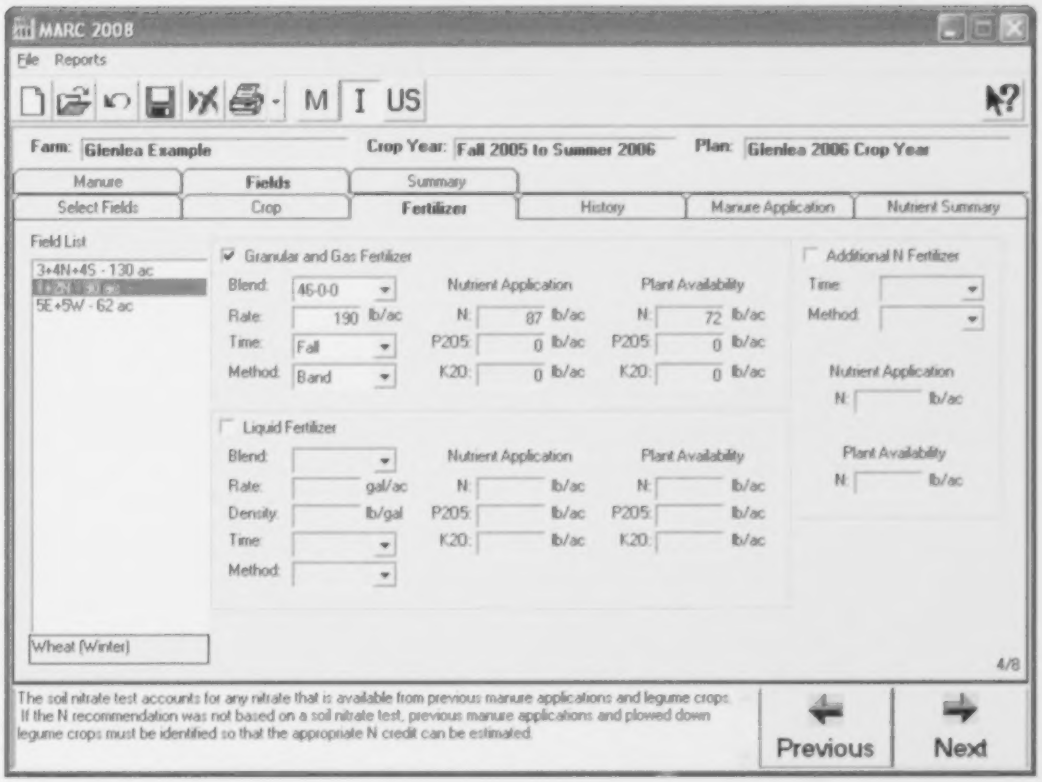
Crop	Example Target Yield	Ave Removal N	Ave Removal P205
Wheat (Spring)	40 bu/acre	1.50 lb/bu	0.59 lb/bu
Wheat (Winter)	75 bu/acre	1.04 lb/bu	0.51 lb/bu
Barley (Grain)	80 bu/acre	0.97 lb/bu	0.42 lb/bu
Oats	100 bu/acre	0.62 lb/bu	0.26 lb/bu
Rye	55 bu/acre	1.06 lb/bu	0.45 lb/bu
Corn (Grain)	100 bu/acre	0.97 lb/bu	0.44 lb/bu
Canola	35 bu/acre	1.93 lb/bu	1.04 lb/bu
Flax	24 bu/acre	2.13 lb/bu	0.65 lb/bu
Sunflowers	22 cwt/acre	2.80 lb/cwt	1.10 lb/cwt
Alfalfa	5 tons/acre	58.0 lb/ton	13.8 lb/ton
Grass Hay	3 tons/acre	34.2 lb/ton	10.0 lb/ton
Corn (Silage)	5 dry tons/acre	31.2 lb/ton	12.7 lb/ton
Barley (Silage)	4.5 tons/acre	34.4 lb/ton	11.8 lb/ton
Soybeans	25 bu/acre	3.87 lb/bu	0.84 lb/bu

6.2.4 The Fertilizer Screen (4/8)

The "Fertilizer" screen contains all of the fertilizer application information. Any fertilizer application must be entered and deducted from the crop nutrient requirements.

Three types of fertilizer may be applied:

- **Granular and Gas Fertilizer** (including anhydrous ammonia 82-0-0)
- **Liquid Fertilizer**
- **Additional Nitrogen Fertilizer**



Blend: Select the blend of fertilizer to be applied.

Rate: Enter the rate of the fertilizer to be applied.

Density: For liquid fertilizers, the density of the fertilizer is entered automatically.

Time: Select the season of application, either fall or spring. The time and method of application will be used to calculate the nitrogen efficiency.

Method: Select the method of application, either band or broadcast. The time and method of application will be used to calculate the nitrogen efficiency.

Nutrient Application: This is the actual rate of N, P_2O_5 and K_2O applied based on the blend, rate and density of fertilizer specified.

Plant Availability (N): This is the rate of plant available N applied. The time (spring versus fall) and method of application (banded versus broadcast) are used to calculate the plant availability of the N, based on Manitoba's Soil Fertility Guide. Fall application of N is considered to be 17% less efficient than spring application. This may be due to denitrification, immobilization and/or leaching. Banding fertilizer N is considered to be 17% more efficient than broadcasting. The nitrogen efficiency based on application time and placement are provided in Table 1.

Table 1. Nitrogen efficiency based on application time and placement (*adapted* from the Manitoba Soil Fertility Guide 2001)

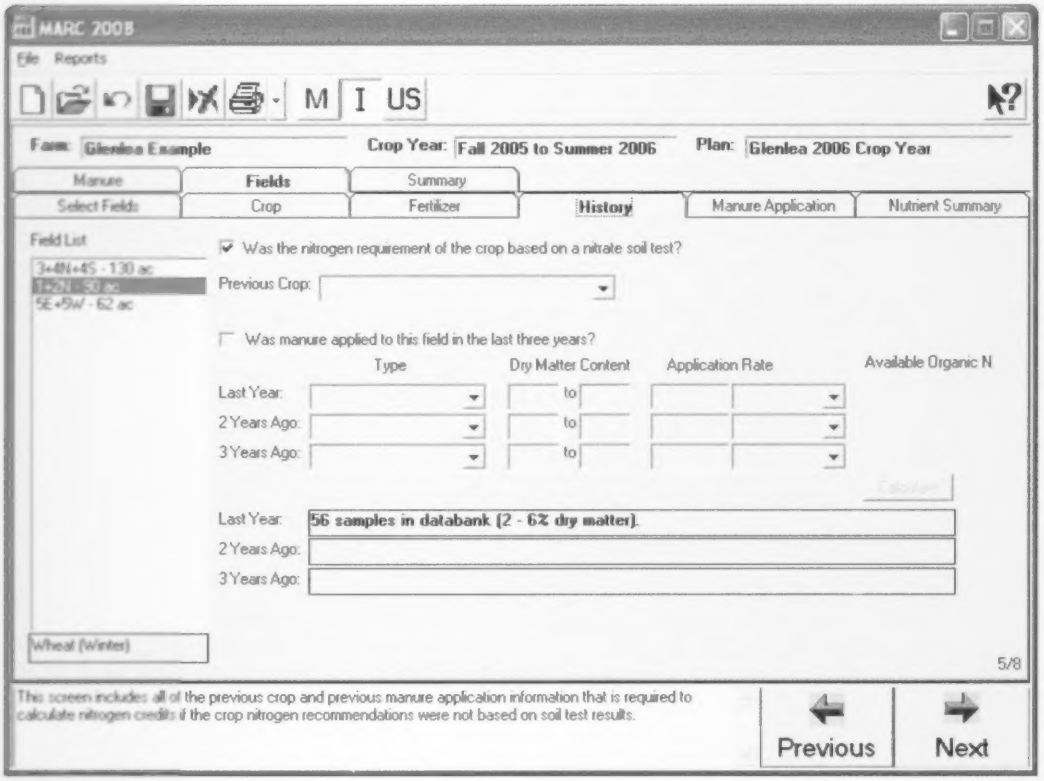
Time and method	Relative N Efficiency
Spring	100%
Fall	83%
Banded	100%
Broadcast	83%

Plant Availability (P_2O_5): This is the rate of plant available P_2O_5. P_2O_5 availability is considered to be 100 % of the P_2O_5 applied.

Plant Availability (K_2O): This is the rate of plant available K_2O applied. K_2O availability is considered to be 100 % of the K_2O applied.

6.2.5 The History Screen (5/8)

The "History" screen includes the previous crop and previous manure application information that is required to calculate nitrogen credits **if the crop nitrogen recommendation was not based on a soil nitrate test.**



Was the nitrogen requirement of the crop based on a nitrate soil test?
The soil nitrate test accounts for any nitrate that is available from previous livestock manure applications and green manure crops. If the N recommendation was not based on a soil nitrate test, previous livestock manure applications and green manure crops must be identified so that the appropriate N credit can be estimated.

Previous Crop:
Some crops, such as perennial legumes, provide nitrogen when they are incorporated into the soil. If the nitrogen requirement of the crop was not based on a soil nitrate test, select the type of crop that was grown immediately prior to this cropping year in order to establish if a nitrogen credit is necessary. The nitrogen credits for various cropping conditions are provided in Table 2.

Table 2. Nitrogen credits for various previous crop conditions.

Crop	Nitrogen Credit (lbs/ac)
Crop other than Perennial Legumes	0
Grass/Legume Breaking	54
Legume Breaking	64
Plough Down	75
Fallow	90

Was manure applied to this field in the last three years?
Manure can provide nitrogen for several years following application. If the nitrogen requirement of the crop was not based on a soil nitrate test, previous manure applications should be identified in order to establish the appropriate nitrogen credit.

Type:
Select the type of manure that was applied during the previous crop year. The nitrogen (N) that will be available from manure applied during the previous crop year is estimated to be 12% of the organic N applied. The nitrogen (N) that will be available from manure applied 2 years ago is estimated to be 6% of the organic N applied. The nitrogen (N) that will be available from manure applied 3 years ago is estimated to be 3% of the organic N applied.

Table 3. Percent of organic nitrogen available from previous manure applications.

Time from application	Organic N availability
This year	25%
1 year ago	12%
2 years ago	6%
3 years ago	3%

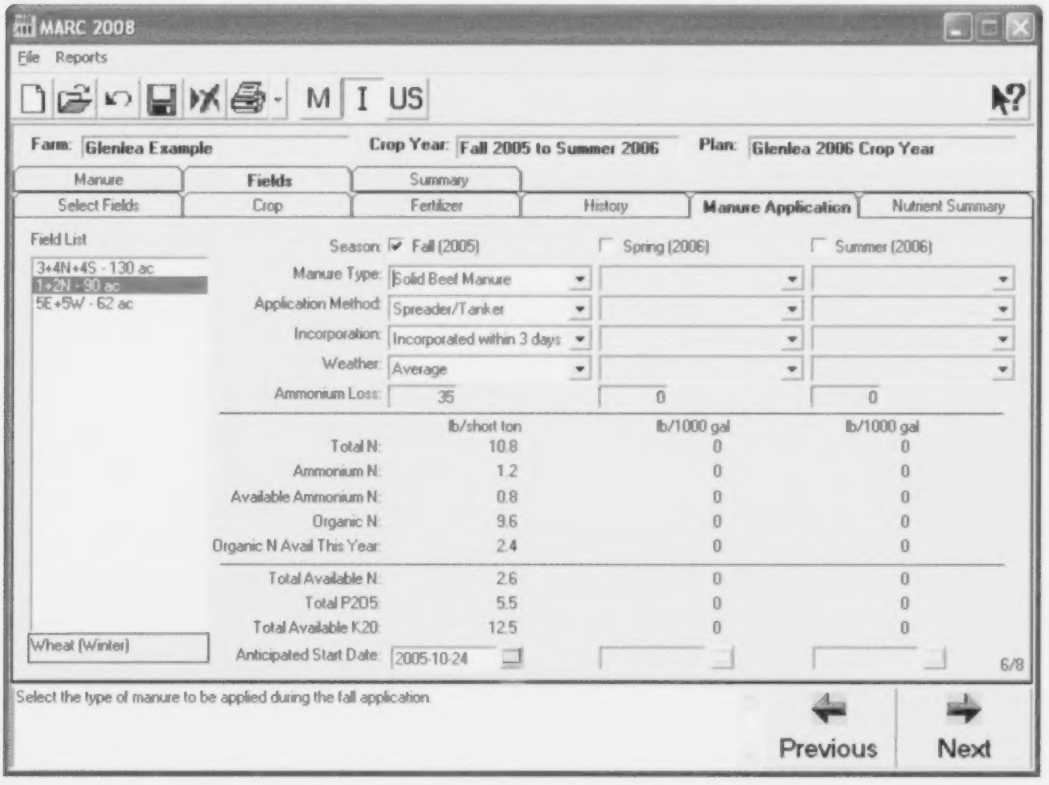
Dry Matter Content:
Enter the dry matter content range for the manures that were applied in previous crop years.

Application Rate:
Enter the rate of manure applied in previous crop years. Select the application rate units for the manure that was applied in previous crop years.

Available Organic N:
Click on the **Calculate** button to calculate the available organic N from each of the previous manure applications.

6.2.6 The Manure Application Screen (6/8)

The "Manure Application" screen contains manure application information that is required to estimate the amount of N, P_2O_5 and K_2O that will be available from the manure.



Season:
You may choose a single application of manure in the fall, spring or summer or a split application using any combination of these seasons.

Check the box for each application season when manure will be land applied. **Fall**

applied nitrogen is assumed to be 17% less available than spring or summer applied nitrogen. This is to account for N losses due to denitrification and leaching.

Manure Type:
Select the type of manure to be applied from the drop-down lists for each season that manure will be applied.

Application Method:
Select the method of application from the drop-down lists for each season that manure will be applied. Liquid manure can be applied using a tanker system, tractor pulled flexible hose or irrigation equipment. For solid manure, select the Spreader/Tanker option. Irrigation of manure is not recommended. The irrigation option will increase the ammonium loss estimates by 10 %.

Incorporation:
Select the incorporation techniques from the drop-down lists that best describe your practices. The ammonium-nitrogen (NH_4-N) in manure can be easily lost to the atmosphere as ammonia gas (NH_3) through a process called volatilization. Volatilization occurs when the manure is exposed to air. Injection and incorporation reduce volatilization losses. The sooner incorporation occurs after application, the lower the losses. Injection or immediate incorporation is best.

Weather:
Select the weather conditions from the drop-down lists that are anticipated at the time of spreading. If the conditions are unknown or are unpredictable, select **Average**. The ammonium-nitrogen (NH_4-N) in manure can be easily lost to the atmosphere as ammonia gas (NH_3) through a process called volatilization. Volatilization occurs when the manure is exposed to air. Weather conditions also affect volatilization losses. Warm, dry conditions result in greater losses than cool, wet conditions.

Ammonium Loss:
The ammonium-nitrogen (NH_4-N) in manure can be easily lost to the atmosphere as ammonia gas (NH_3) through a process called volatilization. Volatilization occurs when the manure is exposed to air. Injection and incorporation reduce volatilization losses. The sooner incorporation occurs after application, the lower the losses. Injection or immediate incorporation is best. MARC 2008 estimates ammonium losses based on the weather conditions during spreading and the exposure of the manure to the atmosphere based on your spreading techniques (Table 4).

Total N:
The total N in the manure can be measured in the lab or estimated from the MARC or farm data banks (screen 1/8).

Ammonium N:
The ammonium N in the manure can be measured in the lab or estimated from the MARC or farm data banks (screen 1/8).

Table 4. Volatilization losses (%) associated with different application methods and weather conditions.

Application Details	Average	Cool Wet	Cool Dry	Warm Wet	Warm Dry
Injected	0%	0%	0%	0%	0%
Incorporated within 1 day	25%	10%	15%	25%	50%
Incorporated within 2 days	30%	13%	19%	31%	57%
Incorporated within 3 days	35%	15%	22%	38%	65%
Incorporated within 4 days	40%	17%	26%	44%	72%
Incorporated within 5 days	45%	20%	30%	50%	80%
Not Incorporated	66%	40%	50%	75%	100%
Irrigated	Above +10%	Above +10%	Above +10%	Above +10%	Above +10%
Standing or Cover Crop/Stubble	35%	25%	25%	40%	50%

Available Ammonium N:
The available ammonium N in the manure is the total ammonium N minus the ammonium N lost through volatilization, and is calculated as follows:

Available ammonium N = Ammonium N x (100-Volatilization Loss (%))

Organic N:
The Organic N is calculated from the total N and the ammonium N as follows:

Organic N = Total N – Ammonium N

Organic N Avail This Year:
The amount of the organic N in the manure that will be available to the crop is estimated to be 25% in the first year after application.

Available Organic N = Organic N x 0.25

Total Available N:
The total available N is the amount of N that will be mineralized from the organic N plus the ammonium N remaining after volatilization losses.

Spring and Summer:

Total Available N = Available Organic N + Available Ammonium N

Fall:
The total available N from fall applications of manure has been adjusted to account for losses due to denitrification and leaching. **Fall applied nitrogen is assumed to be 17% less available than spring or summer applied nitrogen.**

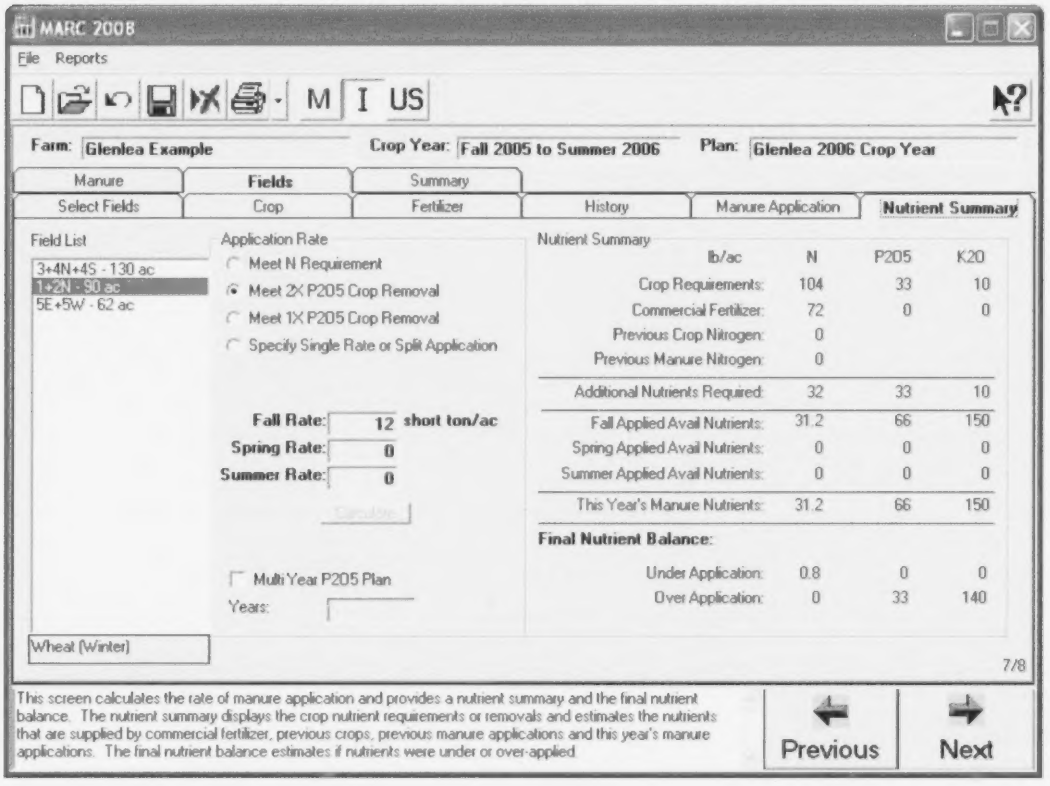
Total Available N = 0.83 x (Available Organic N + Available Ammonium N)

Total P_2O_5:
100% of the P_2O_5 in manure is used in the manure application rate calculation.

Total Available K_2O:
100% of the total K_2O in manure is used in the manure application rate calculation.

6.2.7 The Nutrient Summary Screen (7/8)

The "Nutrient Summary" screen calculates the rate of manure application and provides a nutrient summary and the final nutrient balance.


MARC 2008
File Reports
M I US
Farm: Glenlea Example
Crop Year: Fall 2005 to Summer 2006
Plan: Glenlea 2006 Crop Year
Manure
Fields
Summary
Select Fields
Crop
Fertilizer
History
Manure Application
Nutrient Summary
Field List
3+4N+4S - 130 ac
1+2N - 90 ac
5E+5W - 62 ac
Application Rate
Meet N Requirement
Meet 2X P2O5 Crop Removal
Meet 1X P2O5 Crop Removal
Specify Single Rate or Split Application
Fall Rate: 12 short ton/ac
Spring Rate: 0
Summer Rate: 0
Calculate
Multi Year P2O5 Plan
Years:
Nutrient Summary
lb/ac N P2O5 K2O
Crop Requirements: 104 33 10
Commercial Fertilizer: 72 0 0
Previous Crop Nitrogen: 0
Previous Manure Nitrogen: 0
Additional Nutrients Required: 32 33 10
Fall Applied Avail Nutrients: 31.2 66 150
Spring Applied Avail Nutrients: 0 0 0
Summer Applied Avail Nutrients: 0 0 0
This Year's Manure Nutrients: 31.2 66 150
Final Nutrient Balance:
Under Application: 0.8 0 0
Over Application: 0 33 140
Wheat (Winter)
7/8
This screen calculates the rate of manure application and provides a nutrient summary and the final nutrient balance. The nutrient summary displays the crop nutrient requirements or removals and estimates the nutrients that are supplied by commercial fertilizer, previous crops, previous manure applications and this year's manure applications. The final nutrient balance estimates if nutrients were under or over-applied.
Previous
Next

Meet N Requirement:
The manure application rate can be calculated to meet the nitrogen (N) requirement of the crop.

Meet 2X P_2O_5 Crop Removal:
Nitrogen application rates often result in more P_2O_5 being applied than can be removed by the crop. Over time, this results in a build-up of soil test P. To slow the build-up of soil test P manure can be applied at 2X crop P_2O_5 removal.

Meet 1X P_2O_5 Crop Removal:

To halt further build-up of soil test P, no more than 1X P_2O_5 should be applied.

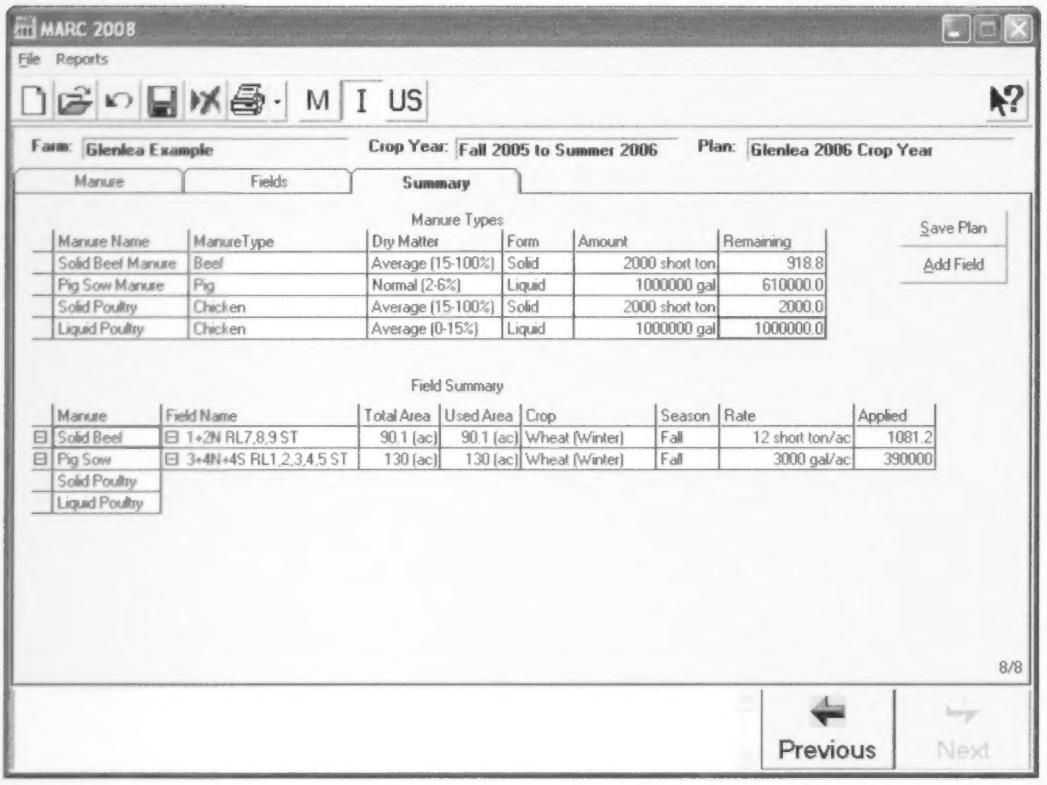
Specify Single Rate or Split Application:
A specific single or split application rate can be entered using the **Specify Single Rate or Split Application** button. Enter the rate of application in the appropriate input box and click on the **Calculate** button to calculate the amount of N, P_2O_5 and K_2O that will be applied.

Multi Year P_2O_5 Plan:
The goal of the 1X P_2O_5 removal rate is to apply no more manure P than can be removed by the crop so that soil test P levels do not increase. Unfortunately, *annual* manure application rates at 1X P_2O_5 removal are often unrealistic or uneconomical. The goal of the 1X P_2O_5 removal rate can still be achieved with a **Multi Year P_2O_5 Plan**. More than one year's P_2O_5 removal can be applied provided that manure is not re-applied to that field until all of the P_2O_5 has been removed by crops grown in subsequent years. For the **Multi Year P_2O_5 Plan** option, the number of **Years** required to remove the P_2O_5 from the manure application is required.

Nutrient Summary:
The nutrient summary displays the crop nutrient recommendations or removals and estimates the nutrients that are supplied by commercial fertilizer, previous crops, previous manure applications and this year's manure applications.

Final Nutrient Balance:
The final nutrient balance estimates if nutrients will be under or over-applied. If nutrients are under-applied, they can be topped-up with commercial fertilizer on the "Fertilizer" screen (4/8).

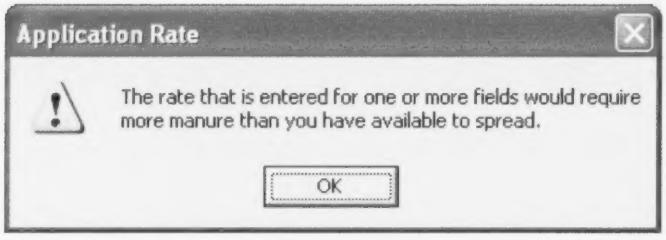
6.2.8 The Land Application Summary Screen (8/8)
The final "Summary" screen provides a summary of manure volumes and field applications.


MARC 2008
File Reports
M I US
Farm: Glenlea Example
Crop Year: Fall 2005 to Summer 2006
Plan: Glenlea 2006 Crop Year
Manure
Fields
Summary
Manure Types
Manure Name | ManureType | Dry Matter | Form | Amount | Remaining
Solid Beef Manure | Beef | Average (15-100%) | Solid | 2000 short ton | 918.8
Pig Sow Manure | Pig | Normal (2-6%) | Liquid | 1000000 gal | 610000.0
Solid Poultry | Chicken | Average (15-100%) | Solid | 2000 short ton | 2000.0
Liquid Poultry | Chicken | Average (0-15%) | Liquid | 1000000 gal | 1000000.0
Save Plan
Add Field
Field Summary
Manure | Field Name | Total Area | Used Area | Crop | Season | Rate | Applied
Solid Beef | 1+2N RL7,8,9 ST | 90.1 (ac) | 90.1 (ac) | Wheat (Winter) | Fall | 12 short ton/ac | 1081.2
Pig Sow | 3+4N+4S RL1,2,3,4,5 ST | 130 (ac) | 130 (ac) | Wheat (Winter) | Fall | 3000 gal/ac | 390000
Solid Poultry
Liquid Poultry
8/8
Previous
Next

Manure Types:
For each manure type, the amount of manure **Remaining** (i.e. that has not been scheduled for land application) is provided. If a negative number appears in red text, there is not enough manure available to complete the land application plan based on the application rate(s) and field area(s) identified.

Field Summary:
The field summary contains the cropping and manure application information for each manure type including field acreages, crops to be grown, season of application, manure application rate and amount of manure applied to each field.

If the land application plan uses more manure than the operation has available to apply, the amount of manure remaining appears in red as a negative number and an application rate warning message appears.


Application Rate
The rate that is entered for one or more fields would require more manure than you have available to spread.
OK

If there is more manure to be applied, an additional field can be added to the plan. To add a field, click on the **Add Field** button.

To save the plan, click on the **Save Plan** button.

7 Manure Management Plan Reports

Livestock operations that are 300 animal units or greater in size must submit annual manure management plans with Manitoba Conservation (Section 13 of the Livestock Manure and Mortalities Management Regulation, MR 42/98). MARC 2008 prints manure management plan forms for the farm and the land application plan. The reports printed by MARC 2008 cover all of the information required by Manitoba Conservation for the farm and the land application plan but they are not identical to the Manitoba Conservation forms. MARC 2008 automatically enters all of the data required for the farm and the land application plan. It also prints out a blank copy of the certification form required by Manitoba Conservation. This form must be filled out manually by the user. **These reports have been approved by Manitoba Conservation.**

The following reports can be viewed from the ***Reports*** function on the main toolbar:

Farm Information: MARC form. MARC automatically enters the information required on this form. See example PDF report in Appendix C.

Animal Unit Inventory: MARC form. MARC automatically enters the information required on this form. See example PDF report in Appendix C.

Manure Storage System Information: MARC form. MARC automatically enters the information required on this form. See example PDF report in Appendix C.

Manure Information: MARC form. MARC automatically enters the information required on this form. See example PDF report in Appendix C.

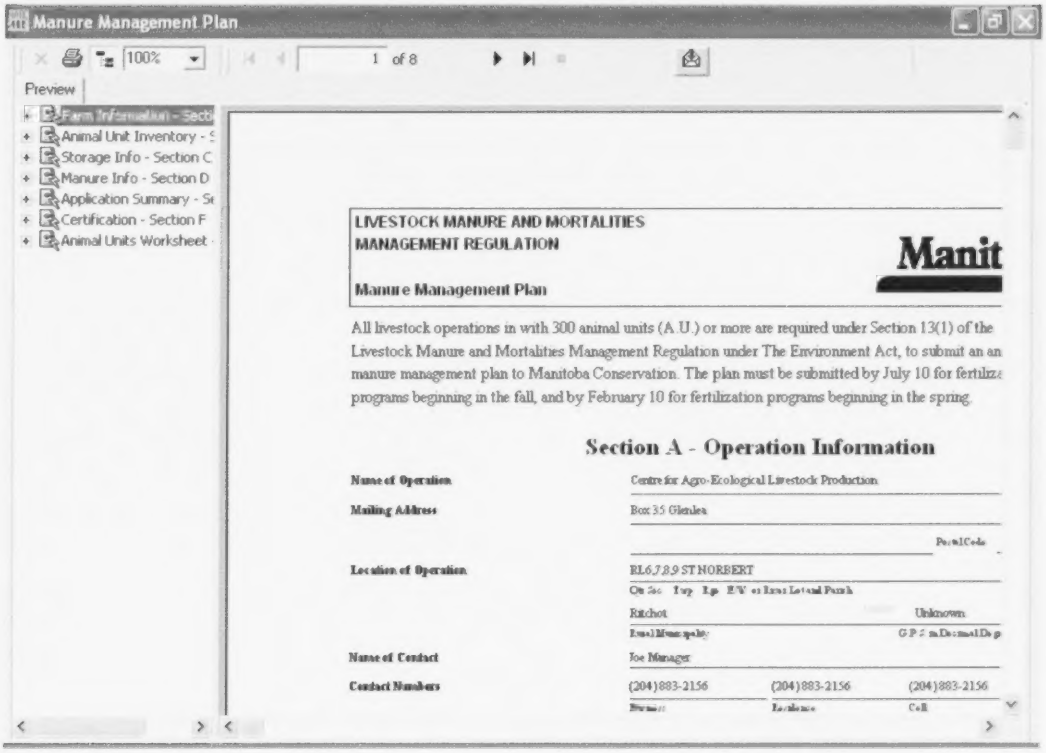
Application Summary: MARC form. MARC automatically enters the information required on this form. See example PDF report in Appendix C.

Certificate of Manure Management Plan: MB Conservation form. MARC prints up this form but the **information must be filled in manually** by the user. See example PDF report in Appendix C.

All Reports: All of the reports can be viewed by selecting the *All Reports* option under the ***Reports*** function on the main toolbar.

Printing Reports

The reports can be printed individually or altogether using the *Print* icon on the main toolbar within the plan or using the *Print* icon on the toolbar within the report.


Manure Management Plan
100%
1 of 8
Preview
Animal Unit Inventory - S
Storage Info - Section C
Manure Info - Section D
Application Summary - Se
Certification - Section F
Animal Units Worksheet
LIVESTOCK MANURE AND MORTALITIES
MANAGEMENT REGULATION
Manure Management Plan
Manit
All livestock operations in with 300 animal units (A.U.) or more are required under Section 13(1) of the
Livestock Manure and Mortalities Management Regulation under The Environment Act, to submit an an
manure management plan to Manitoba Conservation. The plan must be submitted by July 10 for fertiliz
programs beginning in the fall, and by February 10 for fertilization programs beginning in the spring.
Section A - Operation Information
Name of Operation
Centre for Agro-Ecological Livestock Production
Mailing Address
Box 35 Glenlea
Location of Operation
RL6,7,8,9 ST NORBERT
Ritchot
Unknown
Name of Contact
Joe Manager
Contact Numbers
(204)883-2156
(204)883-2156
(204)883-2156

Save Report as PDF File

The reports can be saved in PDF format by using the *Save Report as PDF* icon on the main toolbar of the reports (See example reports in Appendix C). The PDF reports will be saved under Exports in the MARC directory. The filename used for the PDF reports is a combination of the farm name, the plan name and the report name. This function allows you to email to others the plan in the form of easy-to-read PDF reports.

Appendix A: Liquid Manure Application Rate Calculation Worksheet
(Imperial Units)

Line #			
1	Field ID	Crop:	
2	Target Yield		bu/ac
			tons/ac
Step 1 - Nitrogen Recommendation based on Soil Test Result			
3	N		lb/ac
Step 2 - P_2O_5 Recommendation based on Soil Test Result or Crop Removal Values			
4	P_2O_5		lb/ac
Step 3 - Manure Test Data			
5	Total Nitrogen		lb/1000 gal
6	Ammonium Nitrogen		lb/1000 gal
7	Organic Nitrogen (line 5 - line 6)		lb/1000 gal
8	Phosphorus (P)		lb/1000 gal
9	P_2O_5 (line 8 x 2.3)		lb/1000 gal
Step 4 - Amount of manure nutrient available to crop			
10	Method of application		
11	Anticipated weather conditions during spreading		
12	Expected volatilization loss		%
13	Available ammonium N (line 6 x [100 - line 12]%)		lb/1000 gal
14	Available organic N (line 7 x 25%)		lb/1000 gal

Step 5 – Accounting for season of application			
15	Total available N (Spring and Summer Applications) (line 13 + line 14)		lb/1000 gal
16	Total available N (Fall Applications only) (line 15 x 83%)		lb/1000 gal
17	Total P_2O_5 (line 9)		lb/1000 gal
Step 6 - Application rate based on N recommendation			
18	N based application rate (line 3 ÷ line 15 x 1000 for Spring/Summer) OR (line 3 ÷ line 16 x 1000 for Fall)		gal/ac
19	Amount of P_2O_5 applied (line 17 x line 18 ÷ 1000)		lb/ac
20	P_2O_5 balance (line 19 – line 4) A positive result indicates an over-application of P_2O_5. A negative result indicates an under-application of P_2O_5 and additional fertilizer P may be required.		lb/ac
Step 7 – Application rate based on P_2O_5 recommendation or removal			
21	2X P_2O_5 removal rate (2 x line 4 ÷ line 17 x 1000)		gal/ac
22	1X P_2O_5 removal rate (line 4 ÷ line 17 x 1000)		gal/ac
23	Amount of available N applied (line 21 or 22 x line 15 ÷ 1000 for Spring/Summer) OR (line 21 or 22 x line 16 ÷ 1000 for Fall)		lb/ac
24	N balance (line 23 - line 3) A positive result indicates an over-application of N.		lb/ac

	A negative result indicates an under-application of N and additional fertilizer N may be required.		
Step 8 – Select a rate			
If Soil Test P < 60 ppm, select a N rate of application (line 18) If Soil Test P is 60-119 ppm, select a 2X P_2O_5 removal rate of application (line 21) If Soil Test P is 120-179 ppm, select 1X P_2O_5 removal (line 22)			gal/ac

Appendix A: Solid Manure Application Rate Calculation Worksheet
(Imperial Units)

Line #				
1	Field ID	Crop:		
2	Target Yield			bu/ac
				tons/ac
Step 1 - Nitrogen Recommendation based on Soil Test Result				
3	N			lb/ac
Step 2 - P_2O_5 Recommendation based on Soil Test Result or Crop Removal Values				
4	P_2O_5			lb/ac
Step 3 - Manure Test Data				
5	Total Nitrogen			lb/ton
6	Ammonium Nitrogen			lb/ton
7	Organic Nitrogen (line 5 - line 6)			lb/ton
8	Phosphorus (P)			lb/ton
9	P_2O_5 (line 8 x 2.3)			lb/ton
Step 4 - Amount of manure nutrient available to crop				
10	Method of application			
11	Anticipated weather conditions during spreading			
12	Expected volatilization loss			%
13	Available ammonium N (line 6 x [100 - line 12]%)			lb/ton
14	Available organic N (line 7 x 25%)			lb/ton

Step 5 – Accounting for season of application			
15	Total available N (Spring and Summer Applications) (line 13 + line 14)		lb/ton
16	Total available N (Fall Applications only) (line 15 x 83%)		lb/ton
17	Total P_2O_5 (line 9)		lb/ton
Step 6 - Application rate based on N recommendation			
18	N based application rate (line 3 ÷ line 15 for Spring and Summer) OR (line 3 ÷ line 16 for Fall Applications)		ton/ac
19	Amount of P_2O_5 applied (line 17 x line 18)		lb/ac
20	P_2O_5 balance (line 19 – line 4) A positive result indicates an over-application of P_2O_5. A negative result indicates an under-application of P_2O_5 and additional fertilizer P may be required.		lb/ac
Step 7 – Application rate based on P_2O_5 recommendation or removal			
21	2X P_2O_5 removal rate (2 x line 4 ÷ line 17)		ton/ac
22	1X P_2O_5 removal rate (line 4 ÷ line 17)		ton/ac
23	Amount of available N applied (line 21 or 22 x line 15 for Spring and Summer) OR (line 21 or 22 x line 16 for Fall Applications)		lb/ac
24	N balance (line 23 - line 3) A positive result indicates an over-application of N.		lb/ac

	A negative result indicates an under-application of N and additional fertilizer N may be required.		
Step 8 – Select a rate			
If Soil Test P < 60 ppm, select a N rate of application (line 18) If Soil Test P is 60-119 ppm, select a 2X P_2O_5 removal rate (line 21) If Soil Test P is 120-179 ppm, select 1X P_2O_5 removal (line 22)			ton/ac

Appendix B: Dryland Agriculture Capability Guidelines for Manitoba

Based on the Canada Land Inventory Soil Capability Classification for Agriculture (1965), with modifications made for soil application at larger mapping scales.

Subclass Limitations	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7
	No significant limitations in use for crops.	Moderate limitations that restrict the range of crops or require moderate conservation practices.	Moderate severe limitation that restrict the range of crops or require special conservation practices.	Severe limitations that restrict the range of crops or require special conservation practices or both.	Very severe limitations that restrict soil capability to produce perennial forage crops, and improvement practices are feasible.	Soils are capable only of producing perennial forage crops, and improvement practices are not feasible.	No capability for arable culture or permanent pasture.
Climate (C)	All Ecodistricts[1] within ARDA boundary not explicitly listed under 2C and 3C.	Ecodistricts: 664, 666, 668, 670, 671, 672, 674, 675, 676, 677, 714, 715, 716	Ecodistricts: 356, 357, 358, 359, 363, 366, 663, 665	None within ARDA boundary			
Consolidated Bedrock (R)				50-100 cm	20-50 cm	< 20 cm	Surface bedrock Fragmental over bedrock
Moisture limitation[2] (M)		Stratified loams Moderate moisture holding capacity	Loamy Sands Low moisture holding capacity	Sands Very low moisture holding capacity	Skeletal Sands Very severe moisture deficiency	Stabilized sand dunes	Active sand dunes
Topography[3] (T)	a, b (0-2%)	c (>2-5%)	d (>5-10%)	e (>10-15%)	f (>15-30%)	g (>30-45%) Eroded slope complex	h (>45 - 70%) i (>70 - 100%) j (> 100%)
Structure and/or Permeability (D)	Granular Clay	Massive clay or till soils[4] Slow permeability	Solonetzic intergrades Very slow Permeability	Black Solonetz Extremely slow permeability			
Salinity[5] (N) a.00-60cm depth b.60-120cm depth	NONE < 2dS/m < 4ds/m	WEAK 2-4 dS/m 4-8 dS/m	MODERATE (s) 4-8 dS/m 8-16 dS/m	STRONG (t) 8-16 dS/m 16-24 dS/m	VERY STRONG (u) [6] 16-24 dS/m >24 dS/m		Salt Flats
Inundation[7] (I)	No overflow during growing season	Occasional overflow (1 in 10 years)	Frequent overflow (1 in 5 years) Some crop damage	Frequent overflow Severe crop damage	Very frequent (1 in 3 years) Grazing > 10 weeks	Very frequent Grazing 5-10 weeks	Land is inundated for most of the season
Excess Water (W)	Well and Imperfectly drained		Loamy to fine textured Gleysols with improved drainage	Coarse textured Gleysols with improved drainage	Poorly drained, no improvements	Very Poorly drained	Open water, marsh
Stoniness (P)	Nonstony (0) and Slightly Stony (1)	Moderately Stony (2)	Very Stony [8] (3)	Exceedingly Stony (4) [9]		Excessively Stony (5)	Cobbly Beach Fragmental
Erosion[10] (E)		Moderate erosion (2)	Severe wind or water erosion (3) lowers the basic rating by one class to a minimum rating of Class 6 [11].				
Cumulative minor Adverse Characteristics[12] (x)							

1 Smith, R.E., H. Veldhuis, G.F. Mills, R.G. Eilers, W.R. Fraser, M. Santry, 1996. Terrestrial Ecoregions and Ecodistricts of Manitoba, An Ecological Stratification of Manitoba's Natural Landscapes. Agriculture and Agri-Food Canada, Research Branch, Brandon Research Centre, Manitoba Land Resource Unit, Winnipeg, MB. Report and Provincial Map at scale of 1:1.5m.

2 With the exception of class2, ratings as indicated are based on the assumption of a single parent material, using the most readily drained representative of each textural class. Prevailing climatic conditions within the Ecodistrict, soil drainage and stratification will affect the moisture limitation accordingly.

3 Topographic classes are based on the most limiting slope covering a significant portion of an area of complex, variable slopes. Map units with long, unidirectional slopes may be considered equivalent, or one class worse due to an increased erosion hazard.

4 Extremely calcareous loamy till soils with a high bulk density (>1.7 g/cm^3) are rated 3D.

5 Soil Salinity is reported in DeciSiemens/metre (dS/m). Soil will be classed according the the most saline depth. For example, if a soil is non-saline from 0-60 cm but moderately saline from 60-120 cm, the soil will be classed as moderately saline (3N).

6 Strongly saline (u) soils are rated 5N with the exception of poorly and very poorly drained soils, which are rated 6NW.

7 Inundation may be listed as a secondary subclass for some fluvial soils. In this case, inundation is not class determining, but may become a limitation if the soil is otherwise improved.

8 Extremely calcareous loamy till soils with a high bulk density (>1.7 g/cm^3) and stony 3 are rated 4DP (4RP if depth to bedrock is 50 - 100 cm).

9 Stony 4 soils will be rated 4P unless their primary physical composition is sandy skeletal or their parent material is till. In either or both of these cases, the soil will be rated 5P.

10 If erosion is moderate, a subclass of E is assigned as a secondary limitation, but the basic rating is not lowered. If erosion is severe, the basic soil rating is downgraded by one class, and E becomes the primary limitation. For example, if a soil has a basic rating of 4T, the presence of moderate erosion will result in a rating of 4TE. If erosion is severe, the rating will be lowered to 5ET. Erosion will be the sole limitation only if the basic rating has a subclass of X. For example, a soil with a rating of 3X will be assigned a rating of 3E if moderate erosion is present.

11 The rating is not lowered from class 6 based on erosion. A rating of 6TE indicates a soil with g topography and either moderate or severe erosion.

12 Use only for soils with no other limitation except climate. The subclass represents soils with a moderate limitation caused by the cumulative effect of two or more adverse characteristics which are singly not serious enough to affect the rating. Because the limitation is moderate, soils may only be downgraded by one class from their initial climate limitation. Therefore, a soil with a climate limitation of 2c and 2 or more minor adverse characteristics will be rated as 3X. This symbol is always used alone.

Appendix C: Manure Management Plan Reports

Note:

- MARC 2008 automatically enters the information for the farm and the land application plan.
- The **Certification of Manure Management Plan** form can be printed using MARC 2008 but the **information must be entered manually**.

LIVESTOCK MANURE AND MORTALITIES MANAGEMENT REGULATION

Manure Management Plan

Manitoba

All livestock operations in with 300 animal units (A.U.) or more are required under Section 13(1) of the *Livestock Manure and Mortalities Management Regulation* under *The Environment Act*, to submit an annual manure management plan to Manitoba Conservation. The plan must be submitted by July 10 for fertilization programs beginning in the fall, and by February 10 for fertilization programs beginning in the spring.

Section A - Operation Information

Name of Operation Centre for Agro-Ecological Livestock Production

Mailing Address Box 35 Glenlea

Postal Code R0G 0S0

Location of Operation R1,6,7,8,9 ST NORBERT

Qtr Sec Twp Rge E/W or River Lot and Parish

Ritchot — Latitude: Unknown — Longitude: Unknown

Rural Municipality — G.P.S. in Decimal Degrees(if available)

Name of Contact Joe Manager

Contact Numbers

(204) 883-2156	(204) 883-2156	(204) 883-2156	(204) 883-2156
Business	Residence	Cell	Fax

Owner (Legal Name) Department of Animal Science — Not Applicable (Corp File # if app)

Mailing Address Department of Soil Science University of Manitoba

Winnipeg — Postal Code R3T 2N2

Contact Numbers

(204) 474-9139	(204) 474-9139	(204) 474-9139	(204) 474-9139
Business	Residence	Cell	Fax

Affiliate (Legal Name) University of Manitoba

NB: Confirmation of manure spread including actual application rates, analysis of manure, field maps, coordinates (if available), field access location, contact numbers of field owners/operations must be submitted after manure is spread. Additional MMP's may not be registered unless this information is received by Conservation.

Manure management plan required to comply with a Director's Order or an Environment Officer Order.

☐ Yes If yes, Order number: _____

FOR DEPARTMENT USE ONLY

Received by: _____ Office: _____

Date received: _____

Follow-up required: Yes: ☐ No ☐

Nature of follow-up: _____

Proprietary (confidential) information will be protected in accordance with Manitoba law.
Personal information is collected under the authority of *The Environment Act*, the *Livestock Manure and Mortalities Management Regulation*, and will be used to issue receipts, for surveys, administration and enforcement purposes. Information collected is protected by the privacy provisions of *The Freedom of Information and Protection of Privacy Act*. If you have any questions, contact the Access & Privacy Coordinator, Box 85, 200 Saulteaux Crescent, Winnipeg MB R3J 3W3; 1-204-945-4170.

Please complete this form and forward to the Environmental Livestock Program, Manitoba Conservation, Box 46, 200 Saulteaux Crescent, Winnipeg MB R3J 3W3. Phone: 204-945-3078/Fax: 204-948-2420

Section B - Animal Unit Inventory

Animal Type and Subtype [1]	A.U. Produced by One Livestock		Number of Livestock of Each Subtype	A.U. for Each Livestock Subtype
Chicken / Broilers	0.0050	X	3,300	16
Beef / Feedlot Cattle	0.7690	X	80	62
Chicken / Layers	0.0083	X	4,400	37
Dairy / Milking Cows, including associated livestock	2.0000	X	60	120
Pig / Sows, farrow to finish	1.2500	X	100	125

[1] Refer to Animal Unit Worksheet - Schedule A. Retain Schedule A for your records. If additional room is required, the operator may choose to submit a copy of Schedule A. **USE ONLY CATEGORIES LISTED IN THE WORKSHEET.**

Section C - Manure Storage System Information [1]

Location of central manure storage facilities

Type Livestock Manure Stored	Manure Form	Legal Description	Lat	Long	Duration (months)	Permit No. [2] / Reg. No [3]
Pig / Sows, farrow to finish	Liquid	RL6,7,8,9 ST NORBERT			13.3	555555

Location of solid manure field storage (Fill out only if you have field storage)

Type Livestock Manure Stored	Legal Description	Duration (months)
Chicken / Broilers	RL6,7,8,9 ST NORBERT	13.3

[1] Use additional pages if necessary.

[2] A construction permit has been required by Manitoba Conservation for construction of earthen manure storage structures since 1994 and for all other types of constructed manure storage structures since 1998. You may inquire about your permit number at your Manitoba Conversation regional office (see last page).

[3] Registration numbers will be issued by Manitoba Conservation for earthen manure storage structures built before 1994 and all others constructed storage structures prior to 1998.

Section D - Manure Information for Land Application

(One type per page, reproduce pages 4 and 5 as necessary.)

Type of Livestock Manure	Total A.U. of this Type
Beef / solid beef	62

Amount of Manure to be Land Applied

2,000

- [ ] Imperial Gallons (liquid manure)
- [x] Tons (solid manure)
- [ ] Cubic Feet

Manure Analysis

Total **nitrogen (N)** content in the manure	10.83	[ ] lb/1000 gal	[x] lb/ton
Ammonium (NH4)	1.22	[ ] lb/1000 gal	[x] lb/ton
Total **phosphorus (P)**	2.33	[ ] lb/1000 gal	[x] lb/ton
% Dry Matter (DM)	27.9		

The nitrogen value stated above is:

- [ ] Actual (Please attach manure analysis report with this form).
- [x] Estimated

If estimated, please indicate your source of information:

- [ ] *Farm Practices Guidelines for Beef/Dairy/Hog/Poultry Producers in Manitoba*
- [ ] Average values published by analytical laboratory (specify laboratory):
- [x] Other source (specify): MARC Data Bank

Earliest Anticipated Manure application Starting date [1]: 10/17/2005 (Month / Day / Year)

[1] This is the earliest date the first spread of manure will occur on this plan

Note: If manure is to be treated, please complete and attach Schedule B - Manure Treatment
If manure is to be transferred to another party, please complete and attach Schedule C - Transfer of Manure or affluent to a Second Party.

"transfer" excludes situations in which a contractor is hired, or the operator volunteers to land apply the manure from this operation. In this case, Section E - Field Application Summary must be completed

Section E - Field Application Summary

Crop year for which manure will be applied: Fall 2005 to Summer 2006

Legal Description	RL1,2,3,4,5 ST NORBERT			
Field ID	3+4N+4S			
G.P.S Coordinates (4 corners of the field) Coordinates in Decimal Degrees (if available)	Lat 1	Unknown	Lat 2	Unknown
	Long 1	Unknown	Long 2	Unknown
	Lat 3	Unknown	Lat 4	Unknown
	Long 3	Unknown	Long 4	Unknown
Legal Owner's name and phone	Glenlea Example(1)		(204) 883-2156	
Field size (1) (acres)	130.0			
Soil Class and subclass (2)	80% 2W with 20% 3W from detailed 1:20,000 soil survey			
Proposed Crop	Barley (feed)			
Target Yield	50 bu/ac			
Soil Testing	**Nitrate (NO3 - N) 0 - 24 inch depth (lbs/acre)**		**P 0 - 6 inch depth (ppm)**	
	20		20	
Crop Recommendation or Removal(4)	**Nitrogen (lbs/acre)**		**P2O5 (lb/ac)**	
	100		45	
Commercial Fertilizer (7) Applied	0		0	
Manure Nutrients Applied	100		193	
Total Nutrients Applied	100		193	
Multi Year P2O5 Plan	No			
	Manure Application Information			
Application Season	**Fall**		**Spring**	**Summer**
Livestock Manure Type	Beef			
Livestock Manure Form	Solid			
Manure Application Rate	36 short ton / acre			
Application start date (y/m/d)	2005-10-17			
Application Method (5)	Spreader/Tanker Incorporated within 1 day			
Applicator (6) **Name** **Phone** **Licence**				

Fields that are to recieve manure must be soil sampled and the analytical reports submitted to Manitoba Conservation. Sound soil sampling procedures, as outlined on Page 4 of the Detailed Instructions, are required to obtain an accurate soil nutrient assessment.

1 Indicate only the available acres for manure spreading (exclusive of setbacks from surface water courses, etc.)
2 List all of the Agricultural Capability Classes and subclasses (limiting factor(s)) for each field as determined by **PUBLISHED MANITOBA SOIL - SURVEY REPORT, or electronic data distributed by Manitoba Land Initiative website. Provide the source and scale of information used.**
3 As shown on the soil analysis report appended to this form. If soil analysis report(s) are not available at the time of submitting the form, they must be forwarded to Manitoba Conservation 14 days **before** application of manure to allow for processing.
4 Indicate the recommended nitrogen (N) application rate suggested by the soil fertility guide or the soil analysis report.
5 Method of application includes a combination of the equipment used (tanker, spreader, tractor pulled flexible hose or irrigation system) and the time until incorporation.
6 Applicator information required if applicator is not the operator.
7 Additional Fertilizer + Manure Application(s) must not result in soil NO3- above the regulated limit in that crop year.

Note: Plan must be certified by operator on Page 6. If the plan is prepared for the operator, it must be certified by a Professional Agrologist or Certified Crop Advisor on Page 6. Incorrect/incomplete information voids this Manure Management Plan.

Section F - Certification of Manure Management Plan

Note: The Plan must be certified or it is VOID. Mark appropriate box with "X".

I certify that the information contained in this plan is true and that no relevant information has been withheld

Date _____ _____

Signature of Operator

Plan Prepared by:

☐ Operator

☐ Other

If other than operator:

I certify that the information contained in this plan is true and that no relevant information has been withheld

Date _____ _____

Signature of Professional Agrologist or Certified Crop Advisor who prepared plan

Address and phone number of Professional Agrologist or Certified Crop Advisor: _____

Stamp:

FOR ADDITIONAL INFORMATION,
PLEASE CONTACT ONE OF THE FOLLOWING REGIONAL OFFICES

Red River Region 123 Main Street, Suite 160 Winnipeg MB R3C 1A5 Telephone: (204) 945-7100 Facsimile: (204) 948-2338	**Western Region** 1129 Queens Ave. Brandon MB R7A 1L9 Telephone: (204) 726-6064 Facsimile: (204) 726-6567
Red River Region Unit 5, 284 Reimer Avenue Box 2019 Steinbach MB R5G 1N6 Telephone: (204) 346-6060 Facsimile: (204) 326-2472	**Western Region** 27 – 2nd Av SW. Dauphin MB R7N 3E5 Telephone: (204) 622-2030 Facsimile: (204) 638-8626
Red River Region 3rd Floor 25 Tupper Street N Portage la Prairie MB R1N 3K1 Telephone: (204) 239-3204 Facsimile: (204) 239-3215	**Interlake Region** 75 – 7th Ave. Gimli MB R0C 1B9 Telephone: (204) 642-6095 Facsimile: (204) 642-6108
Eastern Region Air Services, Provincial Highway #502 Lac du Bonnet MB R0E 1A0 Telephone: (204) 345-1444 Facsimile: (204) 345-1440	
To report environmental emergencies call 944-4888 (24 hours)	

ANIMAL UNIT (A.U.)[1] INVENTORY LIST

	A.U. Produced by One Livestock		Number of Livestock of Each Type	A.U. for Each Livestock Type
Dairy				
Milking Cows (lactating and dry)	1.3000	X		
Bulls	1.3000	X		
Replacement Heifers (>13 months)	1.0000	X		
Heifer Calves (up to 13 months)	0.3000	X		
Veal Calves	0.1300	X		
Milking Cows, including associated livestock	2.0000	X	60	120
Beef				
Beef Cows, including associated livestock (2)	1.2500	X		
Backgrounder (4)	0.5000	X		
Summer Pasture / Replacement Heifers (3)	0.6250	X		
Feedlot Cattle (4)	0.7690	X	80	62
Pig				
Grower/Finishers	0.1430	X		
Sows, farrow to finish	1.2500	X	100	125
Sows, farrow to weanling (5 kg)	0.2500	X		
Weanlings (5-23 kg)	0.0330	X		
Boars (artificial insemination operations)	0.2000	X		
Sows, farrow to nursery (23 kg)	0.3130	X		
Chicken				
Broilers	0.0050	X	3,300	16
Roasters	0.0100	X		
Layers	0.0083	X	4,400	37
Pullets	0.0033	X		
Broiler Breeder Pullets	0.0033	X		
Broiler Breeder Hens	0.0100	X		
Turkey				
Broilers	0.0100	X		
Heavy Toms	0.0200	X		
Heavy Hens	0.0100	X		
Horse (PMU)				
Mares (including associated livestock)	1.3330	X		
Sheep				
Feeder Lambs	0.0630	X		
Ewes (including associated livestock)	0.2000	X		
Other livestock or operation type	please inquire with your regional agricultural engineer or livestock specialist			

1 One animal unit is defined as the number of livestock required to excrete 73 kg (160 lbs) of nitrogen in a 12 month period, please refer to the *Farm Practices Guidelines for Beef/Dairy/Hog/Poultry Producers in Manitoba* for more information.

2 Do not include calves or replacement heifers; e.g. for 100 cow calf pairs with 30 replacement heifers, simply enter 100.

3 Weaned calves, do not include cow numbers.

4 Cattle on finishing rations intended for slaughter.